CHANGE OF AIR

CONSIDERED

WITH REGARD TO ATMOSPHERIC PRESSURE

IN THE TREATMENT OF

CONSUMPTION & CHRONIC DISEASE

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CHANGE OF AIR.

BY THE SAME AUTHOR.

Shortly will be Published.

ON

SLEEP AND SLEEPLESSNESS,

AND

THEIR RELATIVE INFLUENCE ON
THE HUMAN ECONOMY.

CHANGE OF AIR

CONSIDERED

WITH REGARD TO ATMOSPHERIC PRESSURE, AND ITS ELECTRIC AND MAGNETIC CONCOMITANTS,

IN THE TREATMENT OF

CONSUMPTION & CHRONIC DISEASE.

WITH A

GENERAL COMMENTARY ON THE MOST ELIGIBLE LOCALITIES FOR INVALIDS.

BY

J. C. ATKINSON, M.D.

"The greatest friend of Truth is time; her greatest enemy is prejudice; and her constant companion is humility."—*Lacon.*

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PREFACE.

CONSUMPTION is unquestionably at the head of all fatal diseases. No single malady appears even to approach it. How highly important, then, it is to institute a scientific inquiry into the principles which ought to regulate "Change of Air," when it is known that, after all remedies have failed, medical men recommend travelling—a sea voyage, or some other expedient to secure such change, as the last resource. Sometimes such changes produce wonderful effects, but on what grounds has never been satisfactorily explained. "Change of Air" must therefore be admitted to be prescribed empirically, and not according to any rational principle.

I have endeavoured in this treatise to speak to the best of my ability of the *fal-*

lacies existing in the public mind on this important subject, and to do this in a manner at once philosophical and practical.

I trust, by avoiding all unnecessary technicalities, to make the present work useful and consoling to those who labour under various maladies supposed to require "Change of Air," but whose means will not enable them to go *out of town* in conformity with the usual recommendation and the usual custom.

Scrofula, a chronic disease, has been, and still is, frequently confounded with consumption, or considered to be co-existent in the same habit; but the difference between consumption and scrofula has of late years been more clearly defined, and the peculiarities of each are fully pointed out in the following pages.

Scrofula is commonly attended by enlargement of glands, external to, or on the surface of the body, and these, if the enlargement be not discussed, frequently suppurate and continue discharging, often for many years. If no counteracting remedies are employed, the bones in the neighbourhood

of such abscesses generally become softened, exfoliate, bringing the constitution to its lowest ebb, causing great prostration and a slow and weak pulse. The peculiarities of consumption are wholly of an opposite tendency, and hence the mischief of confounding the two, not only in adopting remedial means, but especially in recommending change of climate, since in phthisis there is an over-oxygenation of the blood. Another very important error consists in confounding bronchial with tubercular affections, the bronchial often continuing to old age, whilst the career of consumption is generally remarkably rapid.

The suggestions here offered for the better management of convalescents in all chronic diseases, viz., those of the heart, brain, lungs, liver, and kidneys, who are trying "Change of Air," or "change in the density of the air," will, I trust, if carefully followed, be productive of decidedly beneficial effects, and assist in prolonging the lives of many suffering even under mortal maladies.

The aneroid barometer, constructed with

thermometer and compass, is well known to the meteorologist. This instrument (made with certain alterations in the dial-plate), which in future I would name hygeiometer, will probably come at no distant period into more general use in medicine.

As a means of judging of the attenuation, or condensation of the atmosphere, as well as of its action on the physical frame, and likewise as an instrument for testing the relative altitudes of places, with a view to their fitness in special cases, it has been hitherto too much neglected.

A satisfactory knowledge of the efficacy of various "health resorts", will greatly outweigh the *prestige* of a residence near a chalybeate or saline springs, marine or inland locality, according to old rule, and will lead, I believe, to the adoption of the course recommended in this book.

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London, S.W.

CHANGE OF AIR.

I was first led to investigate the subject of "Change of Air" in consequence of being frequently interfered with in the treatment of patients. Many invalids are urged by their friends to "go into the country," to "try another climate," in the hope of being infallibly restored by such means to perfect health; they were assured that "change" rarely disappointed any one; "if it did no good, it did no harm." Many by the adoption of such kindly meant advice have lost their lives. Many have lingered in suffering, trusting daily to experience a remission of symptoms, and finally a total cure of their complaints. Many are sent to the "sea-side." Many to fashionable spas, in various parts of

England. Many quit their domiciles for the south of France, Italy, Spain, Portugal, Madeira or the West India Islands, and lastly for Egypt and North Africa. Year after year has seen consumptive patients expatriating themselves to profit by the supposed immunity which tropical countries enjoy from the ravages of pulmonic decay; yet we learn from the statistical reports of the British Army, that twice as many cases of consumption originate in Jamaica as at home among European soldiers.

The same fact was ascertained with regard to the East Indies. Consumption is twice as prevalent at the Mauritius as at the Cape of Good Hope, although an inflammatory state of the lungs is considerably more frequent in the latter colony. South Devon has long enjoyed a high reputation; and, strange to say, consumptive patients have been generally recommended to have recourse to the seaside, anticipating the health-giving property of the air of Torquay,

Torbay, and other marine residences in that beautiful county. I will not enlarge as I might on the disappointments that have been continually experienced; but the grave-yards of those places abundantly testify the deadly influence of misjudged recommendations. I may here notice that a few cases, to show some of the injuries that are inflicted on patients by injudicious advisers, will be found in the following pages.

Persons in health, when they leave home without any defined object in view, and have no taste for seaside studies, soon grow tired, if their destination is to the coasts, of what they call the monotonous face of the "purple sea." They have no eyes for its ever-changing hues; they feel sick with the odour of its salt-laden breezes; they view it as "the barren deep." They perceive no life in its rolling billows, no grandeur in its foam-crested breakers. The long lines of emerald light that flash and tremble on its pebbly shores when night draws

her sable curtain over the sky, have no charm for them. They begin to feel as if they had suffered from some chronic disease, and hurry home proclaiming that A, or B, or C is the most unhealthy place that can be singled out for recreation, and warn their friends against resorting thither. If they should turn their faces inland, with the same dull crassitude, the result is equally useless. The shady lane, the leafy glade

"Where thick, by aspen roots, the violets blow,"

"The clear brook tumbling in crystal over its pebbled bed, singing, as it flows, in the sunny month of June," on, on to the expectant ocean, have no charms for them. Healthful they come, sickly they return. But this book is written not for the healthy but the ailing, and if, even on those in robust health, the effect of climate and scenery and surrounding circumstances be so powerful, what must it not be to those whose nerves are so sensitive that they

tremble at a breeze, and vary with each passing change of atmospheric influences!

Our first attention must be directed to meteorology with regard to invalids, especially the expansion and contraction of the respiratory organs, which are greatly dependent on the electric state of the atmosphere, the character of the winds, and other meteorological influences.

It is worthy of remark that their energy is greatest when the wind is south-west; least, when north-east. Hence, it follows, that the absorption of oxygen by the blood is variable, and this must tell powerfully on those suffering from disease of the chest.

Although meteorology is fast taking its place among the exact sciences, it is still comparatively in its infancy. The barometer gives indications of change in the "skyey influences," but it is not so acute as the sensitive nerve of the minutest insect, the croaking raven, or the crow that hurries to the sheltering wood. It may indicate the

present state of the atmospheric forces, but it cannot, save within narrow limits, foretell the future. Yet how much the health of the invalid depends on these altered states of the air we breathe. We take little note of thermometric influences in such cases, the barometrical are those to which we chiefly refer.

Look at a barometer, examine it carefully, observe the tendency it has from its rise and fall to indicate health or disease, refreshing rest or feverish sleeplessness.

Surely the smallest change, the least disturbance of equilibrium in that fluid mass that presses on the human body from without, and is visited by an equally opposing force from within, must have a mighty influence on all, especially on the nervous and the sickly. Yet how little has this been noticed in the works of those who lay down in certain cases "Change of Air" as a panacea.

Over the mighty sources of nature man has but little control; he cannot command

the winds or check the hurricane, but he has the power, within certain limits, of modifying *climate*. A practical farmer once told the writer that, by drainage, cutting down forests, converting marshes into grain-bearing fields, he removed his spreading acres by degrees into a more favourable climate, and golden harvests were the reward of his untiring efforts.

If science, medical skill, and lavish expenditure of public money can add to the sanitary condition of the invalid in most localities in Great Britain, especially in this great metropolis, the sickly and the weak may take comfort, stay at home, and regret not that their stinted means prevent them from having "A Change of Air." But a little *study* will be advisable; the power of predicting coming weather by the presence or absence of certain phenomena, will be of importance to the valetudinarian, as he will then be ready with measures to guard against any coming evil. Local climate, above all

things, ought to be closely observed. There are special localities where, from the character of soil, elevation, aspect, and water, specific effects are superinduced, either by reason of changes of the blood, or by the digestive organs being deranged. By the application of human skill, Great Britain has been greatly improved in drainage, sewerage, and tillage, and by the increased production of all vegetable substances for food. The atmosphere, the water, the superficial crust of the earth, are portions of the material inorganic world with which we are connected by reciprocal relations essential to our life. Those forces or powers of nature, light, heat, electricity, gravitation, etc., which we cannot define as material, act and react on the human constitution. The simple word "climate" expresses one of the most important relations of man to the natural world around him,—a relation which concerns health in its most intimate connexion with life. Admitting the surface of a man's body to be

about fifteen square feet, and the pressure about fifteen pounds on a square inch, it is computed that a man may sustain 32,400 lbs., or *fourteen tons and a half weight;* but the difference in the weight sustained in different states of the atmosphere may be as much as *a ton and a half,* varying more or less according to altitude. Northerly winds, if the current be continuous, invariably add weight to the atmosphere, while southerly winds diminish the weight; and hence its rise and fall are greatly influenced by ever-recurring aerial changes.

A further consideration of this fact will be requisite; for extended observation will render useful the materials collected on this subject, so as to apply them for the general benefit of mankind.

Dr. Jenner, the great discoverer of vaccination, was a man of acute general observation; and although at the beginning of the nineteenth century the barometer was very little consulted, yet he saw the direct

effect of a diminution of atmospheric pressure on animal life. The following lines give the reader an idea of the extent and correctness of his observations; for inferior animals show, without any reservation or disguise (such as may happen in man) proofs of its effects on their nervous and vascular systems, and thus prevent all cavil or dispute :—

SIGNS OF WEATHER.

BY DR. JENNER.

The hollow winds begin to blow,
The clouds look black, the glass is low;
The soot falls down; the spaniels sleep,
And spiders from their cobwebs peep.
Last night, the sun went pale to bed;
The moon in halos hid her head.
The boding shepherd heaves a sigh,
For see, a rainbow spans the sky.
The walls are damp, the ditches smell:
Closed is the pink-ey'd pimpernel.
Hark! how the chairs and tables crack.
Old Betty's joints are on the rack;
Her corns with shooting pains torment her,
And to her bed untimely sent her.
Loud quack the ducks, the sea-fowl cry;

The distant hills are looking nigh.
How restless are the snorting swine!
The busy flies disturb the kine.
Low o'er the grass the swallow wings,
The cricket, too, how sharp she sings!
Puss, on the hearth, with velvet paws,
Sits wiping o'er her whisker'd jaws.
The smoke from chimneys right ascends,
Then, spreading, back to earth it bends.
The wind, unsteady, veers around,
Or settling in the south is found.
Through the clear stream the fishes rise,
And nimbly catch the incautious flies.
The glow-worms, numerous, clear and bright,
Illum'd the dewy hill last night.
At dusk, the squalid toad was seen,
Like quadruped, stalk o'er the green.
The whirling wind the dust obeys,
And in the rapid eddy plays.
The frog has changed his yellow vest,
And in a russet coat is drest.
The sky is green,—the air is still,—
The mellow blackbird's voice is shrill.
The dog, so altered in his taste,
Quits mutton bones on grass to feast.
Behold the rooks, how odd their flight!
They imitate the gliding kite,
And seem precipitate to fall,
As if they felt the piercing ball.
The tender colts on back do lie,
Nor heed the traveller passing by.

In fiery red the sun doth rise,
Then wades through clouds to mount the skies.
'Twill surely rain, we see 't with sorrow;
No working in the fields to-morrow.

If Jenner had, however, watched the barometer a second time with the meteorological light of the present day, and seen the glass rise from 28½ inches—at which point these peculiar physical phenomena were exhibited—to 29½ or 30 inches, the effects would have undergone a wonderful change, or rather, have been reversed; for the creatures mentioned in his poetry would have had all the feelings of uneasiness pacified or removed, and they would then have proceeded in their daily search after necessary food with joy and gladness; the equilibrium of the circulation,—the result of increased pressure on the vital functions, would have set to rights their little ailments, and have made them light-hearted and cheerful. The braying of the donkey, the bleating of sheep, the neighing of horses, the lowing of cattle, etc.,—all

these sounds give *to the human ear*, at times and on special occasions, characteristic expressions of pain, quite dissimilar to the natural vocal tone,—I may almost say of *ordinary conversation* among these animals, —and which may be pronounced as the result of physical pain or complaint.

And who does not know that man, likewise, when his nervous strings or fibres are out of order, and he is in a state of health termed *under a cloud*,—when the electric forces are perturbed by a varying weight of the circumambient medium, and he is similarly affected,—what an outcry he makes! how uncomfortable he renders his household by his complaints! quite "a changed creature," say many of his family. Evils, misfortunes, calamities, now and to come,—however imaginary in themselves,—have in the sufferer's mind a character of reality which he cannot shake off, till a sudden rise in the "glass" restores him again to renewed life and agreeable prospects. Is not this,

then, a subject worthy of every consideration?

The atmosphere, in its changes, has dominion and power, not only over our lives and fortunes, but even over our *inclinations,* our *discourses,* our *wills*; it governs, impels, and agitates them at the mercy of its influences. This lower world, with all its living freight, is agitated by the slightest movement of the heavenly bodies,—by the motion occasioned by the hygrometric condition of the air, and by the antagonism of the terrestrial and atmospheric electricity and magnetism.

We must, therefore, enter into the scientific part of the inquiry relative to atmospheric phenomena.

It is a well-known fact, that, owing to the remarkable law of the diffusion—or rather the transfusion—of gases of various densities, the constitution of the atmosphere varies but little in different localities. The difference in the constituents of air on the

summits of the loftiest mountain and in the depths of the lowest valley, is almost imperceptible.

But though this is true in regard to the constituents of the atmosphere, it would appear that its electrical properties are liable to great change.

Different years seem to have different intensities, in respect of electricity and barometrical pressure. This is too often neglected or not understood, though such changes are most important to health, especially to invalids. For these reasons, *Change of Air* frequently proves rather injurious to weak constitutions, particularly in *pulmonary complaints*, than restorative. How often does even a passing shadow or a suddenly overclouded sky induce depression of spirits, and increase the malady of the patient! The slightest change in the electrical or barometrical state of the atmosphere affects him more than it does the most delicate instrument; of this the skilful medical practi-

tioner is aware, though the great cause is too often overlooked.

In these days of "high pressure" and dangerous excitement, when body and mind are strained to the utmost point of endurance, *Rest* is the only curative medicine,—a cessation either from mental or physical exertion. Without this, "Change of Air" is worse than useless; the fire is still consuming the vital parts; and the comforts of home being no longer attainable, the patient has only added to his sufferings by his removal from his comfortable fireside, where he may muse by a blazing hearth, and ensconce himself in an easy chair.

We have *now* means in our power of arresting disease and of establishing health, of which our forefathers had no idea. *Chronic cases* require only careful and unwearied management; but professional advisers, tired of their vain attempts to eradicate the disease and mortified at their want of success, often recommend the *get-out-of-the-way*

treatment. The invalid must breathe "foreign air,"—he does so, and the result is too frequently fatal.

The resources of medicine are indeed powerful in these days. Never at any period of medical history were they so potent, and to any practitioner who gives merely ordinary application to his art, the happiest results may be expected. But, like railway travelling, *haste, impatient haste,* both on the part of the professional man and of the patient, leads to a lamentable conclusion.

The disappointed physician advises immediate removal—" change of air alone can do the patient good." Home and its comforts must be sacrificed without any reasonable ground for the proceeding. The state of the atmosphere, electrical and barometrical, is not noticed, or, if noticed, not understood. From a neglect of these phenomena it is astonishing how many apparently trifling complaints assume the most dangerous form.

Diurnal variations of the barometer will

cause great alterations of feeling in the sensitive invalid, sometimes inducing most critical states in the progress of disease.

Persons in health and in comfortable circumstances, spending their lives without any active employment, are generally found complaining and imagining themselves under every malady that the "Medical Dictionary" embraces; and though, like the poet's "idiot boy", they may ramble by the seaside and count the billows plunging on the shore, they are still melancholy and desponding.

This is a species of hypochondriacism that is far more common than many imagine. Few are aware of the fact that expansion and contraction of the respiratory organs are greatly dependent on the character and electric state of the winds. The absorption of oxygen by the blood is therefore variable. The importance of this remark is at once discernible, but this, in the case of invalids, is little thought of. To those in good health, excursions in the summer or autumnal

months are beneficial merely as a relaxation from *brainwork*. Muscle then takes the place of nerve, and the *mens quieta* restores the exhausted powers. The wave dashing on the yellow beach, or breaking in foam on the rocky shore, the vast expanse of turbulent water rushing with the proud majesty of an all-conquering hero to the far-stretching line of pebbled beach, as if it would swallow up the land, and is then suddenly arrested, fill the mind "with thoughts that often lie too deep for tears," and bring health and vigour to the half-shrivelled powers of fancy and imagination; which again react on the bodily constitution. In this case it is not merely *change of air* but change of *scene* that effects a cure, if cure is needed; but in addition to this, it lays up provision for the *tear* and *wear* of the bodily and mental powers.

The material universe by which we are surrounded gives the surest evidence of the wisdom and goodness of that incomprehensible power which, though invisible to us, is

apparent in all His works. The proofs of this crowd upon us on every side. Wherever we turn our eyes, we behold them; the glorious dome of the heavens, clothed in a robe of light, or draped in clouds of every hue, from snowy white, deepening to vermilion, and scarlet, and violet, and purple; while the setting sun, arrayed in robes of gold, descending beneath the glowing sky, and closing the eye of day, communicates a sense of inexpressible grandeur. Nor do the shades of night hide all by darkness. A new and dazzling prospect is presented to us. A canopy of unparalleled splendour is opened to our view.

"The heavens declare the glory of God, and the firmament sheweth forth his handy work. Night unto night teacheth knowledge." Millions of suns strike the astonished gaze, and as our great poet exclaims, infinite space seems "powdered with stars."

But these considerations refer rather to beauty and sublimity, and hence are proofs of

ever-flowing goodness in the great Creator, than to those material agents that are necessary to our existence and happiness. To all reflective minds there is evidently a unity of plan, *according to which* this goodly frame of nature has been constructed. How admirably fitted are the properties of matter to the life, to the health, the enjoyment of all animated existence. How exquisitely balanced are all its forces bearing upon the life that depends on such relations. As has been already said, there are probably no forms of matter in which, even with our imperfect knowledge, a combination of means leading to some beneficial end may not be traced. But such adaptations are especially to be seen in the properties of those substances which are most essential to man's life and welfare. The air we breathe, the water we drink, and the coal we burn, all supply abundant and striking illustration of an intelligence which no finite mind can comprehend.

First let us consider the physical condition of our atmosphere and the properties it possesses, so far as they relate to our present subject, "Change of Air," in regard to medical treatment.

The atmosphere may be fitly described as a vast ocean of invisible fluid surrounding the earth, enveloping it like a mantle, and rising many miles (some say forty), above us, diminishing in density as it ascends, until, at the height of three miles, its density is only one half as great as at the level of the sea; while at the height of forty miles its density is unappreciable. In this globe of air all bodies on the earth's surface are immersed. So subtle is it that it penetrates the minutest pores of matter, and fills the smallest cavities of every organised being. It is truly the medium in which all vital processes take place.

However light the air may be it is still *matter*—matter as surely as the solid rock. It is certainly less dense, but it has all the

essential properties of the hardest materials. It fills space ; it resists compression with an ever-increasing energy. It is true its atoms have a perfect freedom of motion among themselves, but they are incompressible. They yield readily to the slightest pressure, and we move through them without feeling their presence, and though so subtle they are still firm enough to support the wings of the bird of the "cloud-compelling Jove," while they do not detain the tiniest insect in its rapid and glancing flight.

It is a calm summer day, the atmosphere is so still and passive that it seems as if no force were acting on its mass. But there are two mighty powers acting upon it at this quiet moment ; the force of *gravitation* and the force of *heat*. The former causing *weight*, the latter *repulsion* among its particles. By the power of *heat* the whole mass tends to break away from its constraint, but the *force of gravitation*, or the earth's attraction, holds it fast. Were the latter power

to fail, the whole atmosphere would burst with explosive force and be lost in the immensity of space that surrounds us.

It can easily be proved, that the pressure of the atmosphere is about *fifteen pounds on every square inch* of the earth's surface, and hence the pressure on the whole surface of the human body will amount to the enormous weight of from *fourteen to sixteen tons*, how great then the pressure over the whole surface of the earth, and how great the intensity of this ever-acting power, which, it has been said, "Holds the atmosphere in its appointed place." Yet, as the same author observes, this force, immense as it is, is so delicately balanced by the sweet influences of the sunbeam, that it does not so much as shake the aspen leaf, or break the gossamer.

The atmosphere in its constitution is composed of oxygen and nitrogen gas, a small portion of carbonic acid gas, and aqueous vapour; if other substances are sometimes blended with it, they take their rise from

accidental circumstances, and are sometimes of so mysterious a nature as to baffle the keenest researches of science to eliminate them.

But, remarkable as it may appear, the atmosphere varies but little in its properties in localities however far separated; in the deepest valleys, and on the tops of the loftiest mountains, the constituent elements are nearly alike. The grand law of the interfusion of gasses seems clearly manifested in this case. The heaviest gas by interfusion ascends with the lightest to the loftiest heights, hence carbonic acid is found blended with pure oxygen on the steepest cones of the snow-crowned Himalayas, as well as the deep and dark valleys below. The conclusion we would draw from this is, that in regard to health "Change of Air" can do little to affect the state of the invalid when suffering from maladies often incurable, and of an organic character. The question may be asked, does the atmosphere from year to

year continue in the same state? Are there no other forces than those of *heat* and *gravitation* that act upon it? The atmosphere may be regarded as a vast area on which the gigantic powers of caloric, gravitation, magnetism, electricity, light, and other forces are continually displayed; sometimes with secret and at others with palpable intensity. From year to year they vary. Like the undulations of ether, or the vibrations of a pendulum, sometimes short and sometimes lengthened, they oscillate between two extremes, and to obtain a mean between these requires the strict and accurate observation of years.

By these active agents, of whose real constitution nothing is known, the density of the atmosphere—its barometric pressure—is greatly affected; and this really has more to do with "hygienics", or systemic derangements, than has yet been thought of or reflected on.

On close observation of the mercurial

column of the barometer at different times, it has frequently struck me how different the external upper surface of it is ; for when the wind blows from any quarter between north and east and north-west, the bulbous appearance on the upper surface is greatest or more convex, but more especially when the wind is from the north-east. Again, the somewhat flat and indented or concave upper surface of the mercury has been commonly noticed when the wind is from the south or south-west. On extending my researches further, I find the rain, when coming with a south-west wind, likewise similarly affected ; for the globules of rain, on falling, will remain in a firm, globular state or form for many seconds on an umbrella, or any surface of silk, cloth, or gingham, before they coalesce, if the wind containing its magnetic qualities be from the east, south-east, or north-east. But the tendency of adhesive combination of the oxygen and hydrogen, forming waters, if I may say so, is removed, and, on falling on

any texture, the aqueous fluid passes off without possessing any of the peculiar consolidation mentioned above, when the aerial current is from the south-west, south, or west; and in this way the action of electric and magnetic fluids may cause, many of them, physiological changes, and which produce various healthy or unhealthy influences little known among scientific men; for lung complaints invariably exhibit improvement when the convex surface of the mercury has been sustained for any length of time.

It is important to the subject under consideration to give a statement of the internal heat of the earth, for this too has a bearing on the subject of aerial phenomena.

For the last 600 or 800 years, "fire has been dug from the bowels of the earth" in the shape of coals,—a mineral with which we are presumed to be perfectly familiar. In some instances, such as at Whitehaven in England, a gas—analogous to that of our

gas-works—is given off from the coal-mines, which, when collected and properly regulated, supersedes the necessity of erecting retorts and other preparatory apparatus. In these cases, however, the fire and light are not in an active state; we are merely presented with the raw material, and have to elaborate the result by artificial process. We have as yet no such thing as ready-made fire or light from terrestrial sources, unless we are inclined to look upon Etna, Vesuvius, and other volcanoes, in that domestic and somewhat degrading character; but then no man has proposed, or if the proposal has been made, no man has yet been so bold as to clap a safety-valve on Mount Etna in order to divert its flow of liquid lava into the kitchens of the Sicilians; nor have we heard of any project to supply the huts of the Icelanders with hot-water pipes from the Geysers. It is true that advantage has occasionally been taken of thermal springs to make hot baths, as at Carlsbad and Clifton. But,

generally speaking, we have as yet made no progress in bringing into economical subjection the inexhaustible supply of heat which pervades the interior of the globe; the attempt, however, is now in progress, and at the present moment our Parisian neighbours are boring for hot water to heat the greenhouses and menageries of the Garden of Plants. It is a well-known fact, and sufficiently established by experiment, that as we descend into the interior of the earth the temperature increases; and hence, at great depths, the water which issues from the rocks will be sufficiently hot for the purpose contemplated by the Parisians.

According to the observations of Cordier, Arago, Fox, and others, the temperature increases one degree of Fahrenheit for every forty-five feet of vertical descent, after passing the first sixty or seventy feet, which may be influenced by summer's heat or winter's cold. In the mines at Monkwearmouth (the deepest in England), it was

found that while the temperature has been at the surface 49°, that of water, as it issued from the coal at the depth of 1,584 feet, was 71°. A somewhat similar increase of temperature has been found to prevail in all the artesian wells in and around Paris; and hence the obvious conclusion, that water procured from very great depths will be sufficiently hot for economical and hygienic purposes. The artesian well at the Garden of Plants is sunk to the depth of 800 or 900 metres (2,600 or 2,925 feet), where, according to the deductions of M. Arago, the water is obtained at the temperature of 97° or 104° Fahr. This water is conducted by pipes around the greenhouses and menageries, and will communicate a more permanent and equable supply of heat than either air or steam-flues; while, after the original cost of procuring it, it will be maintained so long as the internal heat of the globe remains the same, without further expenditure.

Professor Tyndall, in his lecture on Heat at the Royal Institution, stated, that when air is compressed heat is generated, and that *cold* is *produced* when air is *expanded* ; and these phenomena were proved to be in perfect accordance with the theory of the mechanical equivalent of heat developed by Joule and Mayer, and with the calculations of Newton and Laplace in relation to the velocity of sound, and to the temperature of the air through which it passes.

It was only in April last that Dr. Frankland, in a lecture at the Royal Institution, stated, that the cause of the decrease of the illuminating power of the flame of gas and candles is the decrease of the *atmospheric pressure,* and he showed that it is due to the *admission of oxygen* into the interior of the *flame* through the mobility of the air particles.

One of the qualities by which air is distinguished is its great elasticity ; for it may be compressed, but it expands again as soon

as the pressure ceases. So we find that a certain space near the surface of the earth (say a cubic foot) contains more air than a cubic foot at the distance of *a hundred feet from it.* Again, the quantity of air in *a cubic foot*, at a *hundred feet*, is much greater than when taken at a distance of *a thousand feet* from the *surface*, and so on. The farther we recede from the surface of the earth, the smaller is the quantity of air contained in a determined space. When a greater quantity of air is contained in a certain space, it is said that the air is *more dense*; and when a smaller quantity is found, it is said that it is *more rare.* The density of the air is *continuous* and *gradual*, and it is not difficult to account for this. The air is compressed by its own weight; that is to say, the air close to the earth's surface has to sustain the pressure of the whole volume of air which lies above it, and extends to the very limits of the atmosphere, and by this weight it is so compressed. At

a distance of a thousand feet from the earth, the column of air above it is a thousand feet shorter, and it is more rare. This cubic foot of air, therefore, is compressed by a much lesser weight, and in consequence is not so dense : thus the density of the atmosphere decreases as we recede from the surface of the earth. This peculiar constitution of the atmosphere greatly affects the climate of the globe. The air in itself is neither warm nor cold, but is gifted with the quality of becoming heated by the sun's rays. The degree of heat imparted by the sun's rays to the air depends partly on the length of time during which the rays act on it, and partly on the degree of its intensity ; *consequently dense air has more heat* than that which is *rare.* Places which are low are *much* warmer than places which are some *thousand feet* above the sea-level. When we continue to ascend, we at last come to places where the air is so rare that very little heat can be imparted to it. This thin air

contains so little warmth that water no longer continues in its fluid state, but is converted into ice or snow ; that stratum of air where this change takes place is considered as *a line* marked by nature herself, and called the *snow-line*. It might be expected that the snow-line would be the same distance from the surface at every place in the globe, but this is not the case ; the *snow-line* is much higher in the *torrid* than in the *temperate zone*, and is still *lower* in the *frigid zone*. Let us explain this phenomenon. The density of the air depends much on the manner in which the sun's rays act on it. The greatest degree of heat is developed where the rays pass perpendicularly through the atmosphere ; a much smaller degree of heat is produced when the rays fall obliquely, and the greater this obliquity, the less heat is developed in the air. Those countries only which are situated between the two tropics are heated by the perpendicular rays of the sun ; therefore, a greater degree of

heat is developed in the air, and the temperature is much higher. Countries lying without the tropics, but not far from them, are only acted upon by the oblique rays of the sun, and their temperature is lower. As we recede from the tropics, the degree of heat decreases more and more until we arrive at the vicinity of the poles, where the angle formed by the sun's rays and the earth's surface is so small as to develope a degree of heat that would be hardly sensible if the sun did not remain for several months above the horizon.

This arrangement of nature, of course, greatly affects the elevation of the snow-line. In hot countries it is much farther from the surface of the earth than in temperate and cold ones. By numerous observations it has been ascertained that in those countries which are near the equator, the snow-line is found about 16,000 feet, or three miles above the sea-level. In places which are equally distant from the equator and the

poles, it occurs at an elevation of 9,000 feet, or $1\frac{3}{4}$ mile. Under 60° of latitude, snow is always found on mountains which rise to 5,000 feet, or to less than a mile above the sea-level. At 70° of latitude, at the height of 1,000 feet; and at 80°, the snow-line comes down to the surface of the earth; for countries which are 10° of latitude distant from the poles are covered with snow all the year round, even when their level is only a few inches above that of the sea. Between the snow-line and the surface of the earth is all which is assigned to nature for its organic operations. It is here that all the *plants germinate*, that animals find their food, and man what is requisite for his subsistence and health. But man, though he finds it too cold to settle permanently near the snow-line, visits its vicinity, during the summer, with his herds; and where cattle and sheep would die for want of pasture, the *reindeer* and *yak* find their favourite food. The last-named animal is little known; it lives in the

most elevated parts of the globe, the table-land of Pamir in Central Asia, which by the natives is emphatically called the centre of the world. The yak is of the ox species; it stands about three feet and a half high, and its belly reaches within six inches of the ground; its long hair streams down from its dewlap and forelegs, and its bushy tail sweeps the ground. Other animals require the provident care of man to subsist through the winter. The most hardy sheep would fare but badly without human protection; but the yak is left entirely to itself. It frequents the mountain slopes and their level summits; and wherever the temperature does not rise above the freezing-point is the climate for the yak. If the snow on the elevated flats lie too deep for him to crop the herbage, he rolls himself down the slopes and eats his way up again; when arrived at the top, he rolls down again, and completes his meal as he forms another groove of snow in his second ascent. The heat of summer sends

the animal to places *constantly covered with snow*, and the inhabitants leave their sheltered valleys and follow their herds. The milk of the yak is richer than that of the common cow, but the quantity it yields is less. Their hair is clipped once a year, in spring; it is *strong*, *wiry*, and *pliant*, and is made into ropes, which for strength do not yield to those manufactured from hemp. The hair of the body is woven into mats, and also into a fabric which makes excellent riding-trousers; its bushy tail is the well-known choury of Hindostan, where it fetches a high price on account of its great beauty, and where it is used as a fan. The yak is, besides, used for riding, and on the mountains which it inhabits is preferred to all other animals for that purpose. Wherever a man can walk, a yak may be ridden; like the elephant, he possesses a wonderful knowledge of what will bear his weight. If travellers are at fault, one of these animals is driven before them, and, it is said, he avoids

the hidden depths and chasms with admirable sagacity; should a fall of snow close the mountain-passes to man and horse, a score of yaks driven a-head soon trample down the snow, and make a practicable road.

The snow-mountains of these regions are rarely visited by travellers; such persons are commonly hasty pedestrians, and do not pay much attention to nature; but several of those worthy persons who wished to make themselves acquainted with all the works of God, have not hesitated to ascend the highest summits as far as possible, to explore those districts which appear to be the abode of horror and desolation. They have not been diverted from their purpose by the dangers among the enormous masses of snow and ice on the edge of perpendicular precipices and on the brink of yawning chasms; nor have they hastily withdrawn themselves from the *unpleasant sensations* to which their bodies were subjected by the exceedingly thin air

which they breathed at so great an elevation. These sensations are not experienced near the snow-line, but only when the elevation of the mountain is considerably above it, the most remarkable is the feeling of exhaustion.

When Lieut. Wood was on the "*roof of the world*" in Pamir, he wished to ascertain the depth of the lake Sirikol, and for that purpose tried to make an opening in the ice. He found that the slightest muscular exertion was attended with exhaustion; half-a-dozen strokes with the axe brought the workmen to the ground, and though a few minutes respite sufficed to restore the breath, anything like *continued exertion* was impossible; a run of fifty *yards* at full speed made the runner gasp for breath,—indeed, the exercise produced a pain in the lungs and a general prostration of strength, which was not got rid of for many hours. The human voice was sensibly affected; conversation, especially if in a loud tone, could not be kept up without exhaustion, and the pulse

throbbed at a *frightful rate.* Saussure, when on Mont Blanc, experienced the same effect; and besides, he and his party complained of *dizziness* and *headache*, they *lost* their *appetites*, but were tormented by an *ardent* thirst, which could only be allayed momentarily by cold water. A complete indifference respecting all worldly matters pervaded their minds. When Humboldt attempted to ascend Chimborazo, and had nearly attained its summit, he desisted on finding that drops of blood issued from under his nails and from his eyelids.

And here we will add a table to show that "the volume of equal weights of air at successive heights increases, while the density decreases in geometrical progression," thus,—

Miles above the sea.	Bulk of equal weight of air.	Density.	Height of barometer.
0	1	1	30·00
3·4	2	$\frac{1}{2}$	15·00
6·8	4	$\frac{1}{4}$	7·00
10·2	8	$\frac{1}{8}$	3·75
13·6	16	$\frac{1}{16}$	1·87
17·0	32	$\frac{1}{32}$	0·93

The earth's aerial garment is apparently light; a cubic inch of it does not weigh quite a third of a grain, while the same-sized block, if it were quicksilver, would weigh half a pound; yet on account of its enormous bulk the atmosphere is heavy as a whole. It does really seem that fifteen or sixteen tons must be an unwelcome burden of air for each living human being to have squeezing down upon his skin. In reality, however, the burthen is a requisite one; it is not felt, because, in consequence of the fluidity of the air, the pressure takes place in all directions, it falls inwards and upwards as well as downwards, it is not a load to be held up so much as a load to be kept out. Now, this inward pressing load falls upon soft cushions of liquids and gases held within the chambers of the living body, and merely compacts and keeps them together in a convenient and beneficial way. The air's pressure is exhausted upon the elasticity of the substance of the living frame, just squeezing it

in as far as it can. It does not tell upon the frame as weight; take away the pressure of the air from any living body, and it would at once become bloated and swell out as the skin does under the cupping-glass. In the same way, take off the pressure of the air from the ocean and the waters would all steam up into a vapour and burst into a chaos of mist. The pressure of the air is the regulator of the machinery of life. It is arranged that all necessary operations may be carried on under a wholesome amount of tension and restriction, and the amount of the pressure is fixed at the exact degree which the rest of the economy needs. The *light garment of the earth is very capricious and fitful* as regards the *precise amount of pressure* with which it clings to the denser body, enveloped in its folds. *Heat loosens* and *lightens* the texture, and *cold condenses* and *squeezes* it, *closes* together its substance, and renders it more compact. This caprice of the air is more beneficial to living beings

than that effected merely by its tremulous excitability, for from it arise the movement of the winds, the production of clouds, and all the refreshing influences of dew and rain.

On September 5, 1862, Mr. Glaisher ascended with Mr. Coxwell to a height of seven miles. On this occasion they nearly paid the *penalty* of their enterprise with *loss of life;* in these regions life cannot exist, nor in the boundless space in which our globe revolves, and which includes the planets and system of the universe. "There," say they, "is the hush and silence of death; no creature that we know of can live in those shoreless solitudes; even at attainable heights the sounds which belong to *ourselves* are exaggerated to a *preternatural* force and distinctness; each respiration may be counted, and the beat of our *watches* is a sound remarkably distinct, but there is no reverberation. The clang of the valve door is a noise which fills the vastness, but there is no echo; it is the *sound*, and itself alone.

"I cannot," says Mr. Glaisher, "describe the effect of traversing these vast and trackless solitudes, the sensation of asphyxia warns us that man was created for the earth, and the limits of his existence are defined in space; that beyond these is the kingdom of death, where all animal life becomes extinct. We took with us pigeons. One was thrown out at the height of three miles, when it extended its wings, and dropped and disappeared; a second at four miles wheeled round and round, preparing for flight, taking a dip each time; a third was thrown out between four and five miles, and it fell downwards as a stone; a fourth was thrown out at four miles, on descending, it flew in a circle, and then alighted on the top of the balloon. The two remaining pigeons were brought down to the ground, one had perished with the cold, the other, a carrier, was still living, but it would not leave my hand when I attempted to throw it off; a quarter of an hour after it began to peck at a piece of blue

ribbon round its neck which held the label, and presently, when jerked off the finger, it flew with tolerable strength towards Wolverhampton. We were within seven miles of London and only one of the pigeons returned, which, I am unable to say. When we left the earth the thermometer read 59°, and the dew-point 50°; at the height of *one mile* it was 41°, and the dew-point 38°. Shortly after we passed into the region of saturation, and entered among the clouds, in one place above 11,000 feet in depth; in a quarter of an hour we were above this layer, and came upon a layer of sunlight, with a cloudless sky above of the deepest blue, with endless hills and hillocks, mountain chains, and many snow-white heaps rising from them. At five miles high, the temperature had fallen below zero, *when I became insensible.* A sudden darkness fell upon me, as that of approaching *death*,—an intensity of blackness which has told me since that the optic nerve had lost its powers; after I felt the blinding

darkness, unconsciousness stole over me. With a comrade given to alarm or less active, I had never awoke again; but Mr. Coxwell, tenacious of his life and mine, in the hour of approaching insensibility, seized the valve-cord with his teeth, his hands being powerless, and in two or three pulls effected our return again into more congenial regions."

In speaking of the atmospheric pressure on the human body, it will be well to give a description of the delicate human cuticle, which is readily influenced by its frequent variations, for the electric or magnetic action produces effects which afterwards, for good or for evil, alter the composition of the circulating fluids; and thus diseases are generated. Its sensitive state readily reacts on the organism internally.

The skin is composed of three coats or layers, fitting close to each other, and covering every portion of the body from head to foot. The innermost layer, which is the thickest, is called the *dermis*, or true skin;

its texture is not so close and firm as that of the outer coat, *and every part of its substance is penetrated* by blood-vessels and *nerves*; the latter are the source of *feeling*, enabling us to perform the most delicate operations of touch, and teaching us to avoid what would irritate or give pain. In consequence of this quick perception, the interior organs of our bodies are as well protected from injury as that of the most thick-skinned animals. The outer surface of the *dermis* consists of innumerable fibres, resembling network, full of little cells or bags, containing fat, which yield in every direction, and adapt themselves to every movement of the body. The fibrous network is said to contain the material, which gives the skin the colour in every shade, from the blackness of the negro to the ruddy complexion of the Anglo-Saxon. When the skin is in a state of health, it is always undergoing changes or renewal; the dermis continually pushes up a number of little round cells, which be-

come flattened and hard when in contact with the air, and lap one over the other, something like the scales of a fish. These scales are not visible to the naked eye ; but as there is a never-ceasing supply of the little cells beneath, so there is constant *wear* and rubbing off from the outer surface. The number of pores is so great that 3,528 have been counted in a *square inch* on the *palm* of the *hand* ; in some parts of the body the number is greater, and in others, as the heel, it is less. But taking the surface of a man's body to contain 2,500 square inches, *each one* of the pores to be a quarter of an inch in *length*, the number of pores has been calculated at 7,000,000, and the number of inches of perspiratory tubes at 1,750,000 ; that is, 145,833 feet, or 48,600 yards, or nearly 28 *miles*.

The duty of the skin is the throwing out of two *fluids* ; the one consisting of *waste* and noxious watery matter, the other an oil necessary to keep the skin in health,—

the quantity of watery perspiration is shown to be *thirty-three ounces*, or rather more than two pints in the twenty-four hours, and if by any cause it is stopped serious results ensue.

The nervous energy is invigorated; the digestion, a great desideratum for acquiring power of body, is improved; the balance of circulation, a most important matter, between viscera and skin is maintained, if the air keep a proper barometric pressure and even temperature.

The various functions of the body depend on one another for their healthy actions, and the skin acts, under the influence of barometric pressure, as a regulator of the interior operations and temperature. It is my opinion that the varying action of the atmospheric pressure with its electric and magnetic changes, more than the temperature alone, gives rise to epidemic diseases of *all* characters.

The late Admiral Fitzroy is well known

over the whole world as having directed attention to the barometer (which had been looked upon as a philosophical plaything, of no practical moment, and only useful for consultation when a pleasure-party wanted "fair weather"). He has been able to predict the advent of a storm long before its hurricane power had burst forth. He was able, pretty correctly, to indicate at all times the probable fury of the tempest, and even to point out the day and time of its accession, and thus prevent serious maritime calamities; —all honour to his memory! It was not till after a great deal of scepticism about the accuracy of his views that men—who thought the knowledge of the past was sufficient unto the day—found out that truth was at the bottom of the "Theory of the Storm," and that it was of practical application.

Change in the weight of the air is always accompanied by changes of wetness or dryness, of heat and cold, of storm and calm.

This question may now be considered as having left its indelible prints on the mind of the age, and will need no argument. To me, and others who will follow me, it is left to apply the same knowledge, and the use of the same instrument, for the purpose of health and disease. My readers must already be in a position to admit the probability, if we only consider for a moment that fifteen pounds weight is, on the average, pressing on every *square inch* of the body; that though periodical variations may take place without making any changes visible in the strong and healthy, yet the animal functions acquire by their means a different stimulus; and the excretions and secretions are imperceptibly undergoing changes which give rise to health at one time, and at another to disease. Nothing seems more satisfactory to an inquiring mind, if he simply contemplate the laws of gravitation,—more marvellous than any other power in Nature,—and know that an average-sized human body has to sustain not less than fifteen tons

weight of atmospheric air upon its surface; and although the particles of air are invisible, yet he must admit that life and health are influenced by its changes.

After twenty-five years of continuous observation on the weather, I have become necessarily a convert to its teachings. All medicines are affected in their operations by its various densities, and in the course of the book some testimonies of its action will be incidentally mentioned.

It is well known that the atmosphere contains a large amount of electricity, which in various ways acts an important part both on organic life and inorganic matter. It is greatly concerned in the formation of clouds, rain, and similar phenomena. Some of its effects on the surface of the globe are very remarkable; such as the elevation of huge columns of sand, the production of hail-stones, and the formation of waterspouts. The influence of this power, though subtle, and for the most part invisible, is ever pre-

sent, ever active. It is perpetually producing slow, quiet changes, which escape our notice, except occasionally, when the discharge of a thunderstorm arrests our attention.

When Professor James Forbes, of Edinburg, was near the Col du Mont Cervin in the Alps, he found that the atmosphere was very turbid, and that the surface of the mountain was covered with half-melted snow, while at the same time hail began to fall. This was on a tract on the mountain some 1,500 feet below the Col, but yet 9,000 feet above the level of the sea. While he was walking, the Alpine pole in his hand gave forth a peculiar sound, which the guides explained as proceeding from a worm that was eating the interior of the wood. Professor Forbes knew that the sound proceeded from the electric fluid with which the air was then charged. As a proof of this he reversed the stick, so that the point from which it came at first was put uppermost. In a

moment the sound issued from the other end of it. The fact was that at that high elevation they were so near a thunder-cloud as to be all of them highly electrified by induction; he held his hand above his head, and immediately all his fingers yielded a fizzing sound. Even all the angular and pointed stones and blocks on the mountains were hissing around them, like the points near a powerful electrical machine when highly charged. He told his guides they were near a thunder-cloud; the words had scarcely escaped his lips when a clap of thunder, without any lightning, verified his remark. In this instance, and indeed in every case when the thunder-clouds are low, the electricity produced, by induction, is so powerful that it escapes from all pointed objects in the shape of a flame, but without heat. This flame is what is called in that country St. Elmo's fire; it is frequently seen in thunderstorms at sea, at the top-masts of ships, and at the extremities of their

yardarms. On some occasions, even hail-stones, drops of rain, and flakes of snow have appeared luminous with this electric light.

In countries where there are very elevated mountains, it is not necessary to wait for the revolution of the year to observe the effects of different degrees of temperature. Meteorologists have demonstrated that in every country the atmosphere becomes colder as we ascend, until the cold reaches a great intensity. As a consequence of this law of the atmosphere, a traveller, by merely ascending the slopes of a mountain towards its higher regions, will pass through every variety of climate in the successive gradations of the elevation. The stupendous range of the Himalayas in Asia, and the Andes in South America, present, in one continuous surface, all the climates of the earth, from the glowing vegetation of the tropics to the eternal snow of the poles. The plains around the base of such mountains, and the slopes on their different spurs, are covered with the

verdure of summer; while frozen winter reigns undisturbed on the summits. The inhabitants of snow-capped mountains observe that no snow at all falls in the plains. Higher up the mountains the snow falls occasionally, but rarely; higher up still, it remains a great part of the year on the surface, but melts with the summer temperature. At last, there is a point—a horizontal but somewhat curved line—where the snow never appears to melt, but remains throughout the year.

Between the tropics, snow never falls, except on the tops of very elevated mountains. In these hot regions, the mean height of the line of perpetual snow is about 15,207 feet above the level of the sea. This means, that were you to ascend a tropical mountain, it must be higher than 15,207 feet before you would come to the point or line where the snow never disappeared.

Among the various indications of atmospheric and electric pressure, one of the most

important is that gained by the observation of the pulse, and I shall now add some particulars respecting this, conceiving it to be the true medium upon which the recommendation to invalids of *Change of Air* should mainly, if not wholly, depend.

The following are the ordinary pulsations of health :—

	Beats in a Minute.
In the adult - - -	from 70 to 75
At puberty - - -	- 80 to 85
At the second year -	- - 95 to 100
At early infancy - -	- 120 to 150

But of course this is a state from which there may be some deviations, and these have been considered in a different manner by different practitioners.

There can, however, be no two opinions regarding the strength, regularity, or freedom of the pulse; all these conditions may be present in a healthy individual; but then we have the hard, the wiry, the frequent, the undulating, the intermitting; and these particular states of the pulse will tell, to an

experienced finger, pretty clearly the condition of the patient, and whether any acute or chronic organic disease has been called into existence.

Whether old or young, a proper examination of the tone and character of the pulse will be the surest guide to the medical practitioner what course to employ, in addition to medicinal treatment, in the various distempers for which "Change of Air" is recommended.

Any abnormal kind of arterial beat shows too often functional, if not organic disorder, and we must apply "Change of Air" to individual cases of this nature according to the nature of the complaint.

As digitalis is given with such extraordinary benefit to arrest the rapid circulation in the incipient stages of phthisis; so we may be certain, reasoning from analogy, that danger will assuredly result to such cases by undertaking any means by which the arterial beats are increased.

Dry pure air, or even sea air, on an elevated plateau, will produce that stimulating effect; air of an equable temperature, mixed, as it may be in valleys, by various matters evolving carbonic acid, will consequently be more applicable than the supply of the purest atmospheric air that can be respired. The slow combustion of carbon is attended with less evolution of electricity, as it is a well-known fact that whenever fresh oxygen enters into chemical union with the body through the lungs, heat is evolved.

The value of the examination of the pulse as an index of health and of disease, appears to have been well understood from the earliest ages of medicine; for myself, I place greater reliance on it as a means for the detection of disease, than any other yet discovered. The stethoscope is adapted for those who have an acutely sensitive auditory organ, and who on that account are very rarely blessed with the other four senses,

viz., tasting, smelling, seeing, touching, or feeling, in an equal degree of perfection.

In examining the pulse, reference must be made to some standard to determine whether the number of pulsations, so measured, should be considered as falling short of or exceeding the average, or just, number of the individual.

This standard, it is evident, ought to be the number of pulsations which the radial artery of the individual, so examined, makes in a given time, under similar circumstances, in a state of health, although it is liable to vary from many different circumstances.

The pulses of women are considered quicker than those of men. The difference of temperament is another cause of the differences of pulses. The stature of the body has some influence on the pulse; whether the trial be made after feeding or after fasting, ought also to be well known to the practitioner.

My own pulse beats in the ordinary way, before dinner, seventy-four times in a minute,

and after dinner, eighty times; in the morning after waking, when in health, it is slow and quiet, and is about seventy-two in a minute. It is in sleep when I can get the pulse in a proper condition in my patients.

From the absence or suspension of the numerous exciting causes affecting both the mind and the body, which take place in a waking state, it may reasonably be supposed that the pulse would be slower during sleep. Exercise is well known to quicken the pulse. I have made many experiments under moderate exertion. The effects of bodily motion are as follows;—lying down, 72; sitting, 74; standing, 76; walking, at the rate of three miles an hour, 80; running will increase the pulse to 130 and 140. Speaking is a kind of exercise which has an effect on the pulse; hence silence is recommended to patients who have feverish symptoms; and mental agitation of every kind affects the pulse, and certainly accelerates it.

Having before spoken of the usual cir-

cumstances by which the pulse is liable to be affected in a state of health, I shall now speak of the changes which are produced by disease. The acceleration of the pulse, more particularly if it continue in that state for a series of days without much intermission, is agreed on by medical writers to be the leading symptom indicating the presence of latent disease. Some rare instances, indeed, are said to have occurred wherein the pulse has not been altered from its natural standard; but these are too few to require being noticed in this place.

I have drawn my inferences of the presence of hectic diathesis from the absolute number of pulsations which the artery makes in a given time, particularly if the beats exceed the ordinary pulsations of health by 15 to 30 in the minute. In an adult, 84 beats in a minute are, I believe, usually thought to denote the commencement, or rather, perhaps, the lowest degree of fever; 100 may be considered the usual rate in

hectic fever; and 110 to 125 the number that commonly attends inflammatory disease affecting the lungs or pleura.

When the pulses are higher, you have delirium or insensibility.

The natural pulse is found in some persons to exceed that number, which commonly implies a considerable degree of fever; and in others, the presence of that disorder is strongly marked, though the number of the pulsations may not reach the pitch that is supposed to indicate its lowest degree.

To obviate mistakes from this inconsistency, the number of the natural pulse, be that what it may, has been fixed as the standard from which any variation should be computed; beyond this, twenty, thirty, or more beats, have been assumed as criteria of the pressure of disorder. In all chronic diseases of the chest, the discriminating and judicious practitioner learns from the pulse the progress of the malady, and consequently cannot fail to be struck with the absurdity

of the custom introduced, and persisted in by many, of making from time to time but a momentary examination. I have been long satisfied that it is impossible for a medical man to assist nature in the tubercular diseases, if he refuse to listen to her voice by making a regular clinical or bedside examination of the patient's pulse, during which important inquiry any distraction of the attention, either by talking or otherwise, is highly reprehensible. The pulse exhibits itself hard, strong, tense, irritated and frequent, in the hæmoptysis, or spitting of blood, arising from plethora; and it is small, deep, tense, and frequent in the hæmoptysis, proceeding from organic disposition, which prevails in cachexia, and this rule obtains in people of both sexes and of every age.

In influenza and general catarrhal affections, it shows itself irritated, full, and frequent, when the disease is violent or hypersthenic; and it is small, weak, and frequent in the pulmonary catarrh, complicated with

adynamic fever; the pulse becomes irregular, intermittent and convulsive, when to the other symptoms of the pulmonary catarrh is added the pain which increases in consequence of the effects of the dry cough, followed by some expectoration of mucous matter.

In general, the more the bronchi of the lungs are obstructed with mucus, the more difficult respiration becomes, the intensity of the pain increases in proportion, and the pulse, consequently, shows itself small, more irregular, and more irritated; its intermittency becomes always more pronounced in the suffocating catarrh; the respiration is then difficult, short, noisy, and the intermittence of the pulse, together with other symptoms, concur in showing the great obstruction of the bronchi.

The pulse again is full, rather soft, not at all irritated, at the commencement of hydrothorax, or water in the chest; for the effusion of the serous fluid, which may take

place in both the cavities of the pleura, does not alter in any great degree the order of the movements of the heart, upon which depends the beating of the pulse. This cannot yet show itself, irritated as it afterwards always is, in conformity with the progressive accumulation of water in either cavity of the pleura. The difficulty of breathing finally appears, and to this cause the frequency and irregularity of the pulse are always proportioned. The pulse is hard, then convulsive, small, and frequent, in the paroxysms of asthma, in which the dyspnœa, the hissing of the respiration, and various other signs of this kind, equally concur.

The diagnosis and prognosis of pulmonary consumption are connected with the pulse, which announces its existence, and enables its termination to be foreseen. In fact, besides the hot and burning sensation which we feel while examining the beatings of the artery of a consumptive person, there likewise occur the frequency and celerity of the

pulse which is small, hard, quick, and somewhat irregular in the morning, and quicker, more regular, and somewhat elevated in the afternoon.

Perspiration, with expectoration of pus and mucus, comes on in greater or less quantity in the advanced period of the night, and is attended by a certain obscure redoubling, as it were, of some of its dilations, which is then felt, and this, united with other attributes of the pulse, gives a certain and sure sign of the successive suppuration of the tubercles.

Relying greatly, therefore, on the character of the pulse as a means of prognosis, it is incumbent on the medical practitioner not to advise convalescents change of air to any place or locality where, from natural circumstances of position, an increased pulsation is likely to be acquired, knowing full well that whatever tends, even in the slightest degree, to add, by stimulating action, an increased pulsating power in the system in diseases

of the chest, will assuredly contribute to diminish the period of existence.

It will be clearly seen from the foregoing observations, that my great object is to undeceive the public mind on the subject of "Change of Air", and to point out the course that ought to be pursued, in that respect, with reference to consumption, scrofula, and chronic diseases. My view is somewhat different from the ordinary one taken on these subjects, convinced as I am of the extensive mischief that has been done by a mistaken and indiscriminate recommendation of "Change of Climate", when no such change was called for.

"Change of Air" requires to be employed with the same precaution, care, and judgment, in all the cases under notice, as the substances of the *Materia Medica:*—a small dose of many valuable medicines may be fatal to a patient when not rightly administered, when a large dose of the same may prove not only not pernicious, but highly

beneficial. We all know that sea air is pure and bracing on an elevated cliff, and that it is impregnated with a slight proportion of saline matter, common salt, iodine, bromine, and some others, and these substances, in an aerial form, by acting chemically on the system through the lungs, have relieved cases of a scrofulous character; and we have, on the other hand, on the land more particularly, in rural plains and valleys, the lowest level where vegetation thrives, in which various gases of different kinds, according to locality, are combined, and this is better calculated for the delicate-chested — otherwise the consumptive—than an atmosphere in which a large portion of oxygen is contained.

I wish also to direct attention to a point of special interest, which requires close and particular observation, viz., whether the invalid, thus favourably located, gets nightly five or six hours sleep.

Sleep will be more easily induced should

the barometer stand at 30°, or 30°·35, than if the air is of less density.

If ordinary attempts should fail in procuring sleep, let the invalid, adopting Mr. Gardner's plan, turn on his right side, place his head comfortably on the pillow, so that it exactly occupies the angle which a line drawn from the head to the shoulders would form, and then let him take a full inspiration, breathing as much as he can through the nostrils; after each full inspiration, the lungs are then to be left to their own action,—that is, the respiration is neither to be accelerated nor retarded, and after a few minutes of this mechanical inflation, sleep is frequently induced; the mind must be at the same time fully engaged in the automatic motion, and thus he may be able to invoke "Nature's sweet nurse."

Sleep, to be beneficial, must not be attended with any convulsive twitchings, as it will not then be an index of the restoration of the vital functions. It will be as well to

state here that, from the cradle to the grave, human individuals, young and old, in a state of good health, may be considered to spend, on an average, one-third of their lives in the condition of sleep,—that is to say, taking the day at twenty-four hours, eight may be regarded as the duration of slumber.

Human sleep may well be called diurnal, the general tendency of it being to occur only once in twenty-four hours, and in the ordinary course of things, if age and disease do not interfere, at night.

In many instances exercise promotes sleep, but if too violent or too prolonged, it will in some constitutions prevent it. Again, cold, unless extreme, prevents sleep, and interrupts slumber into which one has already fallen, although a cool head promotes it.

The difficulty of going to sleep while the feet are cold is well known, and often, when the density of the air is changed in the night, and an alteration of temperature takes place, the effect will be to arouse one from sleep.

It will be well to consult the aneroid barometer on going to bed; for if the indicator points to 30, a little more or less, the invalid may look forward with some confidence to having at least, in average state of health, six hours quiet sleep.

"Tired nature's sweet restorer" will be pretty sure, in light cases of disease, to alleviate all the urgent symptoms, and lay the foundation for a restoration to health.

But mayhap in many cases sleep cannot be induced; returning health is looked for, but cannot be obtained, do what we will,—there is insomnia, excitement, melancholy, delirium, and, it may be, transient mania, and "Change of Air" is mainly depended on and looked for to calm down all this. It is quite impossible. Then it is that the *hypodermic plan* of medication may be brought into operation, and that rarely fails to effect its purpose, without in the least deranging the stomach or stupifying the intellect. As the absorption of a sedative through the

skin does not in any way suspend the chylopoietic functions, nor disturb the centre organ—the brain,—as in the administration of ordinary remedies; so thus we may induce sleep,—a state of the animal economy most favourable to digestion, assimilation, and nutrition, and which state Bacon declares to be the "true balm of life," and the best means of prolonging it.

Indeed, it is of little use to recover from a dangerous malady if "Nature's sweet restorer" is wanting; this is a *sine quâ non*,—an indispensable assistant towards the maintenance of health, without which relapse may succeed relapse, till the unfortunate invalid at last succumbs. Under such circumstances, "Change of Air" will effect nothing, however choice the situation, however celebrated the locality. Balmy breezes, saline springs, of professed medicinal virtues and in some cases evidently curative, yellow sand, with sparkling waves or foam-fringed billows beating in wrathful mood against

the granite bulwarks of the beetling shore, however inspiring to the healthful, will avail little to calm the seething brain, and seal the sleepless eye of the feverish invalid. Hence, attention to the number of hours of sleep must be carefully marked. If, as has been stated, an invalid has "Change of Air" and no benefit seems to arise from it, it is because sleep does not regulate the necessary functions of the body. Thus, progress towards health is retarded and expense incurred, with no proportionate amount of benefit. Experience has convinced the writer of this fact in numerous instances, where after long residences in one locality, too much reliance has been placed on the operation of "Change of Air", on the recommendation of relatives and friends. A certain situation, picturesque or otherwise, has been chosen; the invalid gladly seizes the opportunity of removing from home; Hope waves her starry wings over the sufferer, and glowing health is seen in the distance. Alas! dark-

ness shrouds the brilliant scene,—the invalid returns—only to die.

Sleep, and how to obtain it, is the great object to be studied, and every case must be carefully examined to elicit whether *sleep is easily induced* or not, or whether some choice *sedative medicament* be requisite. The body may be placed in different positions when in bed, or other means taken, until six hours at least of comparatively undisturbed sleep be procured. The regulation of diet will do much to effect this, but not all. Medicine, and sometimes stimulants, well selected, will effect much in this way. It is worthy of remark, that *sleep has all the properties of food.* Sleep should be regarded as a repast, rather than as an integral part of our existence. The professional adviser, above everything, must secure to his patient a proportional number of hours, not merely of *rest*, but *sleep*,—sound sleep—*sleep undisturbed* and *without stupor.* Of all the wants of our nature, this is most urgent and irre-

sistible. We can exist longer without food than without sleep.

The most infallible criterion of health is neither the pulse nor the tongue, but dreamless sleep. He who dreams is, though he knows it not, half-awake. What adds to the value of sleep is this, that the body and mind are simultaneously at rest; whereas, when we are awake, it often happens that the mind is disturbed when the body is at rest, or the body may be suffering while the mind is undisturbed. Let this, therefore, be the professional man's chief effort, to procure by every legitimate means balmy and dreamless sleep for his patient, as, when this is obtained, health may be said to be perfectly secured, and "Change of Air" rendered useless. The test, then, by which an invalid may know whether he will progress towards health, is when, night after night, he awakens refreshed by sleep in the morning. On the contrary, if, night after night, "Nature's sweet nurse" is absent, or he can only say

that he has slept two hours or so, he may make himself assured, beyond doubt, that a restoration to health, under such a state of things, is utterly impracticable.

If, then, "Change of Air" is not the panacea which many public men think it to be, what can be substituted for so cherished a nostrum. In these days of high pressure and general excitement, when the material world and its interests engross every power of the human mind,—when the rapid speed of the locomotive and the winged flight of the electric fluid are considered too slow for the keen-eyed merchant and the ardent speculator,—when cares and anxieties and heart-burnings, and all the ills "that flesh is heir to," multiply to those eagerly grasping after riches,—the course is to seek rest and quiet and professional aid; fling your cares behind you, speed to the breezy shore, inhale the oxygenised airs, or with "meaning gaze" and intent awe count the white billows plunging "to the shore;" or, retire to the

shady lane and inhale the breath of violets and drink the balmy dew of the honeysuckle and the sweet-scented briars ;—this is not change of air as such, it is change of scene, calmness, repose, and self-denial.

When some sensitive individual asked the dogmatic Dr. Johnson if the state of the weather had any effect on his powers of composition and the hilarity of his disposition, he laughed at the idea that a cloudy day should darken his intellect, or a falling shower extinguish his genius. Any observer of nature and of a sensitive body would say that the doctor was wrong, for personal consciousness is more powerful than dogmatic assertion ; but the views of a sagacious physician, versed in researches of this character, are often prophetic. If his mind has been long attentive to atmospheric phenomena, he will know that there are moments of despondency, quite uncontrolable, which affect even the most intellectual, and I may say that at such times even

Shakespeare thought himself no poet, and Raphael no painter,—when the greatest wits have doubted the excellence of their happiest efforts. Our worthy lexicographer, Johnson, had he been subject to toothache, would have found out that a dark passing cloud, a few hundred feet above his head, would produce in the dental cavity a shock of nervous pain, like that produced by a Leyden jar charged with electric fluid. To the sensitive, suffering from any form of neuralgia, the variation of brightness and cloudiness of air is a thing that very quickly teaches him to know the overruling influence by which he is so greatly affected. Thus, by reflex action, the electrical and magnetic currents run into the human frame and induce peculiar phenomena, by which many diseases are brought into development. I have ascertained from dentists, in large practice, that in some known conditions of atmosphere,—such as when a heavy misty day is present with leaden-coloured clouds floating

in the form of nimbi, and the wind has been from east or south-east,—they have found that the number of candidates for tooth-extraction is always large, pain of an intermittent character being always present as a marked symptom. If, however, there should be a sudden rise of the barometer, and the sky become clear, the paroxysms abate considerably, and in many instances the demand for "*cold steel*" is entirely suspended, more particularly if the *mercury* points to "*fair*."

In the year 1849, some years prior to Admiral Fitzroy's researches, I published some papers on the subject of the *Influence of the Winds*, and their special effects on health and disease; to these I would refer any reader curious to know the views I then entertained about atmospheric pressure; they will be found in vols. 1 and 2 of the *Lancet* of that year.

Here are a few cases to illustrate the foregoing principles.

Miss —— was attacked with pneumonia, succeeding whooping cough, in the month of

February. The treatment adopted was confinement to one room, where the temperature, being kept equable night and day, might assist the usual medicines in relieving the inflammatory action. After this very short, —I may say rational — treatment, every symptom became favourable, and I was led to hope that this intelligent little girl might continue to go on, without interruption, to a complete restoration; but her friends, or rather the relatives of her parents, strongly interposed against any further professional treatment, and recommended "Change of Air" as the only proper means now left to effect an entire recovery. Thus advised, the mother readily consented to the removal of her daughter (without my consent) to a place in the north of London, noted for the salubrity of the situation from its high site; but, alas! after five or six days the inflammatory symptoms returned, with congestion, and in a few days more, the child succumbed.

A young gentleman, about twenty years

of age, became indisposed, shiverings and fever supervened, and then followed an attack of pleurisy :—this is no uncommon circumstance. I carefully watched the symptoms, and proceeded in the customary way ; a favourable termination was the result. There yet appeared some slight hectic symptoms, with the usual elevated pulse, for which I prescribed with effect ; but while everything promised fair for the patient, I was one morning written to by the father to say my patient was about to be removed to the seaside, as weakness appeared the only ailment that remained. My argument against such a course was unheeded ; for the reply was that everyone recovered by "Change of Air", and it was the *sine quâ non* in all cases of general debility. My remonstrance, or rather theory, about the remaining at home, was looked upon as wholly at variance with the orthodox idea of the practice, and the removal took place to the elevated cliffs on the eastern part of

Brighton. But here again, after a month's residence, active disease of the tubercular character, aggravated by the "change", made its appearance, and a return home was clearly called for by almost daily increasing danger. Within six weeks after his return home, he fell a victim to the disease.

A lady, twenty-five years of age, after being subject to much distressing cough, for which no medical assistance had been sought, was attacked with spitting of blood. The indication of treatment was plain,—inhalation of medicinal agents, tonics, digitalis, entire confinement to the air of one room, and a properly regulated regimen. By the adoption of these means, appetite improved, expectoration greatly diminished, the spitting of blood stopped, and the hectic fever was less constant an attendant than hitherto. It was at this stage of convalescence that anxiety for "Change of Air" was expressed. My opposition was useless. A sweet spot on the south coast of Devonshire was

selected, high above the sea-level, and with commanding prospects, as offering the best remedy for my patient; and accordingly to that spot she was conveyed, where her symptoms became more and more aggravated, and death closed in a short time her earthly career.

Glandular diseases, affecting more particularly the chain of glands of the neck,—or, as I may term them, external cervical glands,—however strumously affected, are always greatly benefited by a seaside residence, if not contra-indicated by some marked symptom of tubercular disease in any internal organ.

The pulse, and the continuance of hectic fever, will point out the line of proceeding, and from what place the most palpable benefit would be derived.

A man of thoroughly sound constitution, two years since, fractured his knee-cap in a stellated manner, having fallen with considerable force on the pavement after slip-

ping on a piece of orange-peel. Confinement and surgical appliances, after six weeks, found him all right, as regarded the union of the two pieces of bone; his health, however, was much shaken. It was my opinion that the reactive influence of sea air, on an elevated site, would do him infinite good; but his friends, notwithstanding, had him removed into the country, on a low level, where he stayed a month in a stationary condition, in fact, without reaping any marked advantage. But adverting to my recommendation, he then started for the East Cliff, Ramsgate; not long after his arrival there he improved daily, and very soon returned home thoroughly restored to health.

In the latter case, let me observe, there was no excessive circulatory action to interfere with his improvement; hence he required no depressent. He needed really the exciting influence of an oxygenised atmosphere, with pressure less than that of the lowest level, to produce vigour

in a constitution debilitated by long confinement to one position of body, and the results exhibited the correctness of the measures taken. I might enumerate many hundreds of cases, in an infinite variety of form, which have, from a defective knowledge of the influence or special action of "Change of Air", terminated prematurely in death, and which, I think, I am justified in saying, may be classed under the category, "preventable deaths."

At the present day, every builder engaged in rearing structures for human residences selects high ground; in fact, any unprejudiced person who has made a "circumnavigation",—if the use of a nautical expression may be allowed,—or one who has, in modern phraseology, "locomoted" around this modern Babylon within a distance of twenty miles in any direction, north, south, east, or west, will find, not a little to his astonishment, that all the elevated sites, from twenty to five hundred feet above the sea-level, have

been pitched upon for mansions, villas, cottages, of every description or order, the builder resting his faith on the supposed immunity of high places from diseases.

The public in general, likewise, from a superficial knowledge of sanitary requirements, believe in the formula "high and dry," such situations exempting them, in their own ideas, from all the impure gases and diseased mists of the surrounding country; and thus they leave their happy homes in the valleys below, and look forward to leaving behind them all their maladies,—they escape to the brow of the hill with a full conviction that up there all will be right. Unhappily, they know not that the atmospheric pressure to which they may have been accustomed every year, month, week, day, hour, minute, and second, for a series of years, must cause in the animal economy such a fitness, or equilibrium, in the excretions and secretions, that a change of this

nature, thoughtlessly effected, will often bring about serious consequences.

Mountaineers in general are a hardy race, and possess strong appetites, having great powers of digestion provoked by a lighter pressure upon their whole bodily surface. As we proceed to expound our views, we trust this part of the subject will appear more clear to our readers.

The treatment of diseases by panaceas and nostrums falls every now and then into a lull, but seldom fails, in a short time, to start up again in full vigour, as if the tendency to it were something inseparable from human nature. It would not be easy to mark down the various kinds of drops, elixirs, and waters, that have been trumpeted forth to the world; or the various modes of applying magnetism, mesmerism, hydropathy, and homœopathy,—all these have done serious mischief in their day,—carried up into popularity, I may say, by the ascending swing of the great pendulum of human

caprice, and flung down into obscurity, as it returned in its oscillations, to give place to some other folly, whose destiny was to rise and sink again in like manner.

The last and most universal of these panaceas is "Change of Air." It is pertinaciously recommended and forced upon every one, whatever may be the nature of the patient's disorder; he must take himself to some new quarter of the globe and release himself from the doctor's clutches, as nothing can renovate the body like "Change of Air."

The dangers to health, in the adoption of the practice, so vehemently recommended by all, are indeed great, and many are the persons who have been injudiciously sacrificed when suffering from active and even chronic organic diseases. Do we not find especial advocates for every watering place and spa in Great Britain? and does not each individual consulted advise his (to him) particularly healthy locality for the successful treatment

of every case? The place may be dear from some cherished associations, but he has acquired no well-grounded knowledge, from practical experience, of its fitness.

Tuberculous disease,—otherwise consumption,—so often affecting the fairest of England's daughters and the most promising of her sons, is, without exception, increased in its intensity by a removal to any elevated plateau near the seaside, or the dry thinner air of the hill or mountain, even although occasionally barometric changes may render a higher situation suitable for a time.

Antagonistic action is what is wanted to stay the rapid confluence of symptoms in that fatal malady, and not pure air. The air of Rome in particular is much lauded as a suitable residence for such invalids. But how is it? Malaria, a source of disease peculiar to the Campagna, is endemic;* it is

* The peat districts of this country, and in Wales and Scotland, lying low, are generally considered more free from phthisis than other parts conti-

from this that the inhabitants suffer, and, strange to say, the consumptive, already affected, rarely appear to be injured in their constitutions by it. The bane to others is antidote to them; and as Satan, in Milton's noble poem, says, "Evil be thou my good", so is it here. The equalising of the circulation, or rather diverting to another organ the morbid secretions, tends to ward off the enemy for a time in the most efficient manner.

When the question of "Change of Air" is discussed, the most important feature to be regarded, next to stethoscopic manipulation, is the state of the pulse; for many observations have confirmed the opinion I originally formed that, in an adult, if the pulse be high, or frequent for any series of days, no benefit will result from the prescription

guous to them; the composition of peat being trunks of trees, of leaves, fruits, stringy fibres, and the remains of aquatic mosses, resting on the surface of the soil, sometimes covered by sand and gravel.

"Change of Air", unless that air is known to have the greatest amount of atmospheric pressure.

I earnestly hope no one will accuse me of usurping the position of the universal philosopher, or of presuming to deliver anything in these pages as entirely oracular. It is sufficiently humiliating to our nature to reflect, that our knowledge at the best is but as the rivulet,—our ignorance as the sea.

The organisation of the physical economy is such that we require a continual substratum of solids and fluids, from which our frames get the pabulum for motive and nervous force, varying, of course, in quantity and quality in nitrogenous elements, according to this diffusion, and again, according to the means at our command, the constitutional ability that each individual has of assimilating them into the circulation. I trust that the abstainer or teetotaller will not hurl his shafts of vengeance against me, because I am bound to expose the egregious folly of

condemning the temperate man, or even the invalid, who has been induced occasionally to renovate his languished energies by the use of alcoholic fluids.

The diseased liver or heart—and there are few in this world without some form of organic disease latent in their body—requires stimulation on account of the low nervous temperament of the person who is its victim ; he really needs some alcoholic preparation to secure relief for the depressed state of the vital functions, or he must have a more clear atmosphere and of less density.

How uncharitable are men devoted to the practice of teetotalism, knowing not the medicinal quality of alcohol! for the constitutional peculiarity of the circulation and respiration of such persons as I have indicated is to become slow, the heat of the body lower, the secretions and excretions inadequate ; the whole of the functions are exerted with difficulty ; and surely if under such a state of things many are compelled

to take that which acts like a charm and reanimates the whole frame, no blame ought to be imputed to them. Thirst, under such circumstances, is frequently a morbid symptom, and if stimulants are used with reasonable moderation, they have in this state no destructive tendency, but add to longevity, the object that is gained being the promotion of hunger; and by thus acting, supplies, adequate to restore the equilibrium of the body, are admitted into the alimentary system.

The character of the air needed in such cases must be cool and dry, with the least amount of atmospheric pressure; and that which will bring about hunger will certainly diminish daily the love for any undue amount of alcohol.

The time will arrive when the art and science of medicine, which has done so much for the community, and which has not always been gracefully acknowledged, will have attained to the highest state of possible per-

fection. This will cause the treatment of these cases to be differently conducted, and it will no longer receive the condemnation of the well-meaning, but sadly mistaken "total abstainer." But this is a digression.

In recommending "Change", one or two seasons must not be taken as the average climate of a spa or a watering-place. Meteorological observations, to be depended upon, ought to be taken for twenty years at least in many minute points, and especially as regards barometric and thermometric readings.

Further, to stay morbid action in the lungs, a moist, low, marshy situation is preferable to high and dry; the latter is eminently adapted for the scrofulous, glandular, and hepatic patient, and for some forms of cardiac disease.

The humidity of the atmosphere is an essential requisite in cases of consumption, as it occasions a tardiness in the circulation and moderates the insensible perspiration. In some situations, the moisture of the at-

mosphere is such that torpor and lassitude supervene. Damp places in cold weather, without free ventilation, will be productive of remittent attacks of fever. Still, even this may be considered to have an antagonistic action on the tubercles, and thus to prevent their maturation.

Dry cool air, from its possessing a sufficient degree of elasticity, is a decided benefit to hypochondriacs and to those suffering under general chronic affections, by exhilarating the pulsations, and by rousing the nervous system to activity and increasing hunger; but it is apt to generate inflammatory disorders by thickening the blood and producing congestion in the lungs, — a result to be highly deprecated by those who trace any hereditary predisposition to pulmonary disease of the tubercular character.

Scrofula and phthisis, no doubt, require very different treatment, although they are often confounded with each other, and the

same curative means adopted for both. In the former case, the pulse is slow and feeble, and all the functions languid, demanding exciting and supporting remedies, and "Change of Air", calculated to increase the circulation; whilst in consumption, the indication is to diminish the action of the arterial system by depressing the pulse to a moderate standard.

Hence, the treatment beneficial to one would be damaging to the other.

This view of the subject was strikingly illustrated by Dr. Guggenbühl, who established an hospital for infant cretins on the heights of the Abendberg, in Switzerland. Cretinism he considered closely allied to scrofula, the symptoms of the latter being often, if not always, found in cretins, and the same remedies being generally applied for both. There is an interesting notice of this establishment in *Chambers's Journal* for May 6, 1848.

Dr. Guggenbühl found by examining the best authors on the subject, from the cele-

brated Dr. Saussure down to the living physicians of Switzerland, that all agreed as to one important fact, that cretinism never showed itself above the height of 4,000 feet in the mountains, and that children attacked by it and immediately carried up into a purer and freer air were sure to recover.

Messrs. Schlubler and Buzzoni have shown by their experiments that the human lungs absorb, in the mountain air, a much greater quantity of oxygen than in the plains,—a fact, indeed, generally known.

But this increased absorption of oxygen, which is required on the slow pulses of scrofulous persons, would infallibly destroy the consumptive patient whose arterial circulations are already rendered morbid by excessive action.

Diet, again, is an important matter for consideration in reference to health and disease.

The nutriment must vary according to the physical character of the individual and

his habits of life. All vegetables do not flourish alike in the same soil, or in the same temperature.

The horticulturist understands thoroughly the nature of the soil required for the perfect growth of particular flowering plants; the dahlia will not thrive in clay, but needs an alluvial earth; the mountain-heath will wither and die in the soil of the reedy marsh; the standard rose grows to perfection in clayey soils.

The temperature of the atmosphere is another point of great importance in the cultivation of plants; but the isothermal line, according to botanists, cannot be relied upon as the universal rule to be observed for propagating trees, shrubs, or plants from one zone or hemisphere to another. I do not think that there is any certain prospect of vegetable productions attaining, when transplanted, the same excellence in growth and constituent elements as in their indigenous climate, without elevation, temperature, and

aspect being taken into consideration. I consider the elevation of different ranges of hills with different aspects as the most essential requisite to be kept in view; and this has never been sufficiently attended to in the removal of trees or plants from the isothermal line of one continent to that of another.

Man, also, in his several stages of existence is not equally nourished in all situations; the food of the adult, who has always resided in the plains, would not be suitable for a man who has been constantly breathing many hundred feet above the sea-level.

Thus, we find a difference between the food of a man of leisure and that of the hard-working labourer, the food of the mountaineer and that of the wanderer in the plains. The mean weight of the atmosphere gives the necessary power for digestive purposes, diminishing and increasing that power according to the ratio of pressure. The exhaustion of the system, incidental to high

sites, must be quickly supplied to prevent a kind of asphyxia; while, on the contrary, nutrition remains in the body for a much longer time in the plains.

A word or two in passing on the medicinal treatment of consumption by inhalations of chemical gases, which is acknowledged to be the most efficacious of all the means adopted in that dangerous malady. Carbonaceous matter,—even gas from coals,—will, when judiciously administered, prove beneficial. This causes, in my opinion, a suspension of tuberculisation, for how else can the fumes of creasote, pitch, tar, and naphtha, influence the mucous surface of the lungs?

Sedatives, again, of vegetable origin, viz., digitalis, conium, hyoscyamus, and also cod-liver oil and fat, have a like action; in fact, the main object seems to be to prevent the pure element, in the shape of atmospheric air, from irritating the tubercular deposits.

The fashion, then, at the present day, of recommending "Change of Air" in all kinds

of cases, is fraught with the most dangerous consequences to the consumptive.

Among such, with a generally rapid pulse, the exhalation of carbonic acid gas is great; the purer the character of the air, the greater the pulsations, and the greater the inflammatory action which produces the suppuration of tubercles; hence the danger arising to persons labouring under a disorder of the above nature upon removal to a country air, and more particularly to sea air. The fire already consuming the patient does not require combustible materials. If you desire the sufferer to live, seek a mixed and moist atmosphere, the best that can be obtained, and which can be most easily got in a metropolitan or semi-urban residence. The first effects after removal to pure air are marked, and these too often mislead the judgment of friends; for first you have an accelerated pulse caused by an increased supply of oxygen, and an excitement of the brain similar to intoxication, and this impresses

on the mind of the invalid an erroneous idea of decided "Change for the better." This delusion, however, soon vanishes, and the real condition of his case dawns upon him.

A happy and even temper is an invaluable shield against the already excitable disposition of a consumptive patient, but how can you effect the object by removals and "Change of Air". The pulse is heightened, the continued irritation daily increases the tubercular deposits; and hence an earlier death ensues.

An example of our meaning will be found in our large metropolitan hospitals; these, however well calculated for the surgical department of medicine, are ill-suited for cases wherein such delicacy of constitution exists, and wherein a rapid waste of tissue is proceeding, and the subjects of which have not for years been in a favourable sanitary condition. I have known a great many persons who have been placed in the large wards of hospitals, suffering under some accident or

some comparatively trifling derangement, but who were not constitutionally improved by such residence, ventilation being now carried on to the greatest extent in all our public institutions. The average supply of air, considered as essentially necessary for each individual, varies between 1,500 and 1,800 cubic feet. But the lungs of people in the lower walks of life have not been used to respire an element so uncontaminated; and and hence, many have complained of their residence in these establishments as having been productive of actual suffering. Habit cannot and must not be too rapidly interfered with; it should be understood that our functions of life acquire habits, so to speak, according to the position of the individual in the world, and thus evil often results to the poor from the best intentions of the rich.

Would it be right to diet a person in affluent circumstances, who can command all the delicacies of life, and has contracted luxurious habits and refined taste, on old Dorset cheese

and dry bread? Why, if you did not bring about the change gradually and carefully, you would certainly starve your self-indulgent liver; and you would starve in like manner the Dorset labourer, possessing the solvent gastric power of a boa constrictor, who had accommodated his stomach to the above supposed indigestible diet, if you compelled him to adopt the luxurious habits of a citizen whose digestive apparatus was of a less energetic character.

Moisture has been considered as a great enemy to health; and all investigations on the subject have pronounced the inhaling of vapours, even though of a purely aqueous nature, as highly detrimental.

How will men holding these notions be able to combat the oldest practice for the preservation of health, viz., early rising. The sun, first risen from his bed, spreads his effulgent calorific rays over the earth's surface and causes evaporation; it is this watery vapour, often objected to by valetudinarians,

that is so conducive to the free respiratory action; it is this, with the genial warmth of the luminary, that gives a salutary influence to the circulation, and by the moisture and the electric rays equalises and stimulates all the functions of life. Most old people have attributed their longevity to having adopted the practice of early rising, although now it is rapidly getting more into disfavour, and considered as even sometimes "honoured more in the breach than in the observance."

Dr. Carpenter observes, "Independently of the utility of water as an article of food, and of the part it performs in the chemical operations of the living body, by supplying two of the most important materials, oxygen and hydrogen, there can be no doubt that a certain supply of moisture is requisite as one of the conditions, without which no vital action can go on.

"A cold drying wind will be felt as invigorating to the relaxed frame, as it is chilling to one that has no warmth or moisture

to spare. On the other hand, a warm, damp atmosphere, which is refreshing to the latter, will be most depressing to the former. All who have tried the effect of closely fitted garments, impervious to moisture, are well aware how oppressive they soon become,—this feeling being dependent upon the obstruction they occasion to the act of perspiration, by causing the included air to be speedily saturated with moisture."

When the fluids of the system have been diminished, either by the suspension of a due supply of water or by an increase in the excretions, there is a peculiar refreshment in a damp, soft atmosphere, or in a warm bath, which allows the loss to be replaced by absorption through the general cutaneous surface. The reality of such absorption has been placed beyond all doubt by observations upon men who had been exposed to a hot dry air for some time, and afterwards placed in a warm bath; for it is found that the system would, by this unusual means, supply

the deficiency which had been created by the previous increase in the perspiration.

The usual practice with me in the hot, dry summer days, is to place several large flat dishes, filled with water, in the rooms of persons labouring under any attack of sudden pulmonary disease, and this generally produces a considerable alleviation of the symptoms.

The effect of a moist or dry atmosphere, then, upon the animal body, cannot by any means be unimportant, even though there exists in the body itself a series of the most remarkable provisions for regulating the amount of its fluids. The influence of atmospheric moisture, however, is most obvious in disordered states of the system. Thus, in persons who are subject to a form of dyspepsia called "atonic," which is usually connected with a generally relaxed condition of the system, a very perceptible influence is experienced from changes in the quantity of atmospheric moisture, the digestive power

being invigorated by dryness and depressed by damp. Further, there are some forms of pulmonary complaints in which an irritable state of the mucous membrane of the bronchial tubes has a large share. When this irritation presents itself in a dry form, a warm, moist atmosphere is found most soothing to it; whilst a drier or more bracing air is much more beneficial, when the irritation is accompanied by a too copious secretion.

There is an amount of carbonic acid gas set free by the respiratory process peculiar to animal life; and this consists in the rapid changes which take place in the muscular and nervous tissues during the period of their activity, every development of muscular force being accompanied by a change in the condition of a certain amount of tissue. In order that this change may take place, the presence of oxygen is essential, and one of the products of the union of oxygen with the elements of muscular fibre

is carbonic acid. The same may be said of the nervous tissue. Hence it may be stated, as a general principle, that the peculiar waste of the muscular and nervous substances, —which is a condition of functional action, and which is altogether distinct from the general slow decay common to those tissues, —is another source of the carbonic acid set free from the animal body, and the amount thus generated will consequently depend upon the degree in which these tissues are exercised. In animals which are chiefly made up of the organs of vegetable life, in whose bodies the nervous and muscular tissues form but a very small part, and in whose tranquil plant-like existence there is but very little demand for the exercise of their structures, the quantity of carbonic acid thus liberated will be extremely small. On the other hand, in animals whose bodies are chiefly composed of muscle, and whose life is an almost ceaseless round of exertion, the quantity of carbonic acid thus liberated is very considerable.

How beautifully does this explain the operation of the damage and the waste of muscular tissue, by the existence of a too rapid but yet regular and constant action of the respiratory organ, evidenced by increased pulsations in pulmonary affections! and, again, does this not clearly mark the importance of suspending, by all legitimate means, the rapid evolution of carbonic acid? There can be no doubt that human life may be prolonged considerably by the application of rational means of treatment; and I feel assured that, by the diffusion of any practical views gained from observation, much good will be attained. It is not only in disease, when the system becomes acutely sensitive to external agencies, that I would particularly urge an examination of the grounds upon which I base my treatment; for speculative physiological deductions have not hitherto thrown much light on pathological conditions of the body. With the view of procuring a fair judgment, I had at the

same time two patients of similar age, similar constitutional bias, and under similar character of disease, of the tubercular kind. I have not hesitated, when urged, to allow one of them all the fancied advantages of "Change of Air", viz., seaside or perhaps country air, without regard to special locality. This patient, perhaps, has been at every possible expense in procuring the best accommodation in some favourite locality, and has likewise had the best supply of nitrogenous food; yet, after a month's residence, the patient is found willing to admit that he does not perceive himself any better, but rather worse; and further, he thinks the place was not suited for him,—the air was too bracing or too relaxing, etc. A second change is followed by the same result, and finally, he resolves on returning home. Here he again becomes my patient, and I find him almost *in articulo mortis*, but by proper measures and rest he continued to linger on a short time, and then sank under the malady.

Now, the other patient, whose means would not enable him to ruralise, is by my advice restricted to the use of one room, or two at the utmost; and here, by properly regulated temperature and medical treatment, and a favourable site, he existed, and continued to live (in a plant-like manner, certainly) very much longer than the other.

I make these statements from a diary, out of a number of cases of a like nature. I have tested and proved by experience that this is the right course to pursue, when an insidious disease has commenced its ravages in the lungs, or any other organ, if it be of the nature under consideration, viz., of phthisis.

Whatever, then, tends to accelerate arterial action and abbreviate the proper proportion of sleep, will shorten existence materially; while, on the contrary, that which sustains and equalises the circulation and improves the stamina of the sufferer, will most assuredly prolong life from one year to

many, and that even in the latter stages of the malady.

It is a singular fact, which has been experimentally proved by me, that a marked diminution in the frequency of a consumptive cough is experienced by any patient who sleeps on the ground-floor of a high house, after having been in a top bedroom, even when it is as fifty to one foot; and notwithstanding this trifling difference in density of air, the change will compose the system of many persons, induce sleep, and lead to the acknowledgment by the patient that even this removal, confined as it is to the smallest area, is not without special benefits,—animal waste is less, the circulation quieter, daily amount of wearing cough diminished, and appetite improved.

My researches in this department of medicine were first awakened, and my opinion strengthened, by repeatedly finding that certain members in a large family were continually being influenced by atmospheric

changes. The mercurial column, whenever it noted the greatest pressure, say thirty inches, and a north-east wind, generally assured me of the character of symptoms that I might expect in their several cases,—in fact, I was able to judge when a milder or stronger dose of medicine became necessary. Thus, by the study of the barometer, I have been led to anticipate answers to my questions in such a way as to convince my patients that I possessed some secret means of divining their diseases which was peculiar to myself, and which gave me an importance in their eyes as possessing a prophetic spirit. Alas! how little do we know of the mysteries of creation!

The atmosphere is everything to animal and vegetable life; its various densities and temperature have their manifold uses, each entirely distinct from the other.

The poet Cowper observes in one of his letters to the Rev. W. Bagot, "You perhaps have never made the experiment, but I can

assure you that the confusion which attends a transmigration" [meaning a removal to another part of the country in search after health] "of this kind is infinite, and has a terrible effect in deranging the intellects and, I may add, damaging to the health. To an invalid, the preparations, the anxieties necessarily attendant on change of place, are great; even the convalescent, however he may, by the kindness of friends and their thousand little attentions, be protected from suffering the least uneasiness; yet the circumstance of going to an unknown place will add excitement and acceleration to the pulse, which may occasion a recurrence of unfavourable symptoms."

Our knowledge, if purely chemical and philosophical, must not guide our steps even in the selection of a highly azotised food. For instance, gluten, the principal nutritious element of wheat, is not supplied unmixed; if, in fact, we tried to live entirely on this pure chemical or nitrogeneous matter, we

should die, or at least have some malady superinduced. Again, we have other things of daily consumption, such as wines and fermented liquors, but we do not ask for alcohol. Again, tea and coffee, wholesome as they are, are not mere dilutions of theine and caffeine; in fact, I might range over the whole area of edible substances, and always find that Nature's supply, in her own combinations and not that of our chemistry, must be looked to for regulating our diet.

It is well known that the atmosphere, which is as necessary as food, is composed of oxygen, nitrogen, carbonic acid, and watery vapour, according to locality.

The common attack on what is called bad air has been generally made on carbonic acid, and it is supposed that it is highly prejudicial to human life to have even the smallest portion of it mixed with air, because in its uncombined state it is poisonous. Now many persons find considerable advantage in being confined in small rooms, made comparatively air-tight, or

close, and yet, withal, improve in general health wonderfully if under properly selected diet, more especially, as I have before stated, if there be any tubercular disease to remedy.

The Esquimaux, the Russians, and many of the northern tribes of Europe, shut up their huts almost hermetically, and yet suffer no inconvenience, and live to a respectable age.

Carbonic acid is said to be eliminated both by the lungs and skin; its property is sedative; it quiets the whole system, and in small quantities is wholesome and necessary to the existence of mankind. Soda-water and seidlitz-water have large quantities of carbonic acid in suspension, and who questions the exquisitely quieting influence of their action on the nerves and stomach? Not one; and yet what opposition has there been to absorbing this really beneficial gas. If water be impregnated with carbonic acid it diminishes thirst and lessens the morbid heat of the body. It is highly esteemed in

the cure of typhus fever, in irritability, and weakness of the stomach and disorders of the kidneys. I am of opinion that oxygen, in a state of purity, is likely to be just as pernicious as carbonic acid to animal life; but the All-wise Creator has happily blended them in proper proportions for beneficial purposes which do not appear sufficiently palpable to the theorist. He wishes, entirely on chemical grounds, to be supplied with oxygen alone.

Notwithstanding numerous speculations in the present day on the subject of the propagation of epidemics generally, very little is known of the influence of atmospheric agents upon the animal economy, and their connection with epidemic diseases. I do not wish to charge the Sanatory Associations and their promoters with any wilful exaggerations, for we know that much good has resulted from the carrying out of many excellent arrangements for the removal of animal and vegetable refuse, in a state of

decomposition; all I wish to say is, that these investigations are only apparently or partially correct, and I am convinced that both the ordinary organic diseases, or special febrile visitations, and the mortality resulting from them, have not had their origin as stated by these gentlemen.

The influence of climate and season of an abnormal condition—diet, ordinary habits of life, and variable conditions of atmospheric pressure, with electric and magnetic fluctuations, require to be taken into account, and we must not presume that we have arrived at a satisfactory theory of the origin of disease until we have found one resting on some more irrefragable proofs than those which have hitherto been adduced.

Asiatic cholera has been known to defy all human efforts for its suppression. Every one knows, at least, all medical men do, and old Indian medical officers in particular, that the above fatal malady, in its epidemic form, has hitherto travelled with irregular but

tremendous strides from the plains of Hindostan, and passed on, like the determined march of a conquering hero, ravaging and destroying with equal mortality the inhabitants of the Hindoo-Koosh, continuous with the Himalayas, which are calculated to be 32,000 feet above the level of the sea, as it did those of the Sunderbunds in Bengal, which are on the lowest level. This is not to be accounted for by the ordinary laws which regulate the propagation of disease. There was no exemption from the attacks either in valley or hill, but happily these were not made simultaneously, but they occurred at different periods, now at places of one elevation and now those of another, either at a temperature of 120 degrees, or at below zero. How from the equator and the torrid zone the epidemic, without losing one atom of its character or virulence, passed onward northward to the Caucasian mountains, and over them onward almost to the arctic circle, is a matter of history.

In Russia medical men observed that it frequently passed on heedless of the assistance of the winds, for many places were ravaged though the winds continually blew towards them from an uninfected part, no communication having taken place between the affected and unaffected neighbourhoods, thus proving its purely atmospheric character; for it has been clearly shown that malaria has nothing whatever to do with the production of cholera.

Notwithstanding the alarm that epidemic cholera has created in this country and over the whole continent of Europe, it appears from past experience that the malady is found to attack, according to some unintelligible laws, certain spots or localities like a blight or blast in vegetation. It virulently destroys human beings of a peculiar temperament as a blight does vegetable organisms, and after a period suddenly disappears. Often a fortnight or three weeks seem a sufficient time for its most destructive opera-

tions, and frequently the area is of small superficial compass, the magic circle being between five to fifty acres of land surface, sometimes less and sometimes more. It is clear in this case that "Change of Air" is the true panacea, for the attacks are invariably of a more tractable nature out of the supposed malignant choleraic locality or "circle" of infection.

From a consideration of the above remarks, I beg to observe, that to assign one particular material as the cause of an epidemic, is neither correct nor rational. We are not, because one locality escapes from the prevailing epidemic, to jump to the conclusion that it arises from tangible causes and some offensive odours, and from these only. Too numerous are the agencies afloat, at particular periods, which produce disease; and yet no meteorological observation, no chemical analysis has had the effect of clearing up the mysterious point.

And now a word or two about diet, con-

sidered especially with regard to consumptive patients.

Professor Liebig has ingeniously made the distinction between what he terms plastic elements of nutrition, and elements of respiration.

To the former belong	To the latter,
Vegetable fibrine.	Fat.
Vegetable albumen.	Starch.
Vegetable caseine.	Gum.
Animal flesh.	Cane sugar.
	Grape sugar.
	Milk sugar.
	Pectine.

In the flesh-eating animal, the waste of the tissues is very rapid, the temperature, as it were, being kept up in a great measure by the burning of azotised matter; in a vegetable feeder it is probably not so great, non-azotised substances being consumed in the blood in the place of the azotised.

I have made the above extract to show the burning action or combustion during the chemical changes in the lungs, when a too

highly azotised diet is adopted in pulmonary complaints, and relatively to show what dangers must ensue in tuberculous cases by inhaling a too exciting air. Thus, azotised materials in too large quantities, in the food of persons labouring under the above-named diseases, would preternaturally increase the circulation of the blood, and would require elimination by great exercise of the body. Strong nitrogenous food is necessary for persons who are in the enjoyment of health, and have sound excretory and secretory organs, and who can take sufficient exercise to promote good digestion.

The same kind of aliment is not requisite nor proper for the weak, when that weakness is dependent on a tuberculous or cachectic constitution. Every one knows that the appetite is, in many cases of consumption, really enormous, and that from the full indulgence of such cravings, no strength but weakness results. Now, it is clear that the inordinate supply leads to rapid chemical

changes in the lungs, hastening rather than retarding the destruction of the tissues, and thus diminishing the nutrition of the body; while by moderation and judgment in the character of food, and guided by the pulse, great benefit would result.

In scrofula, and many chronic cases, quite a different condition of things exists, and we may daily observe the improvement occasioned by highly azotised regimen and oxygenated air.

Is there anyone possessed of common sense who does not recognise among his relatives, friends, and acquaintances, the existence of a great variety of tastes,—I mean gustatory taste, and powers of digestion? Let any watch only at a public dinner-table, and he will quickly perceive with what avidity different articles of the *cuisine* disappear, clearly showing "*de gustibus non est disputandum*" to be a very true as well as trite maxim,—for both solids and liquids disappear, I may say, without any respect

for qualitative or quantitative fitness, all are thrust into the stomach; for some are endowed with ostrich's gastric juice, and quickly convert the *olla podrida* into wholesome blood, but many do not, to their pain be it spoken. We must not, therefore, be despotic in our ideas of the management of individual constitutions, for it would be unjust to expect that all tastes are of an uniform character. Nourishment, we know, is variously absorbed, and the waste of the system by the excretory organs is obviously very different in different persons,—one will take fifty or sixty ounces of solid food daily; another, only one-half as much, and many even less than that; and each, after many years, be equally nourished, and able to go through an equal amount of exertion. One will take, as necessary for his health, a quart of fluid at each meal; another will do well with a quarter part only, and some with very little;—in fact, there is the greatest variety of temperament existing in this

matter. Why should we, then, from any hobby of our own, force or threaten people to adopt one uniform—or pretendedly uniform—course of diet, when the power of digestion, of excretion and secretion, varies so considerably. We require to be liberal in our views about air, about diet, about medicine, and to believe truly, "What is one man's food is another man's poison." Dr. Parkes states the amount of space and ventilation necessary in hospital wards. He vindicates, by careful and elaborate detail, the necessity of at least 1,000 or 1,200 cubic feet to each person, and of a corresponding amount of eighty feet of superficial space. He is in conflict again with Dr. Edward Smith, who thinks that, with proper ventilation, 500 feet of cubic space would suffice for health. Thus, there is a controversy at the present day on a vital point, the litigants not looking to the requirements of different temperaments.

But to return. There is one peculiarity

connected with scrofula, which draws a striking line of demarcation between it and tubercular consumption, viz., that the former is commonly developed without the presence of tubercular matter, and there is, in consequence of its absence, a widely different radial pulse compared with that which is found in phthisis. In scrofula, there is more or less an impoverished condition of the blood, as proved by chemical analysis, and in proportion as this exists, so is the strumous habit manifested in some form or other.

In the animal chemistry of the celebrated Simons, of Berlin, we are told that in scrofulous affections the blood is deficient in solid constituents, especially in fibrine; and it is inferred from the corpuscles, viz., blood-globules, being somewhat devoid of colour, that there is also a deficiency in the quantity of saline matter. In consumption, however, it has been observed, that whatever be the stage of the disorder at which the blood is analysed, the fibrine seems always on the

increase and the corpuscles on the decrease ; and further, it seems that, generally speaking, the amount of fibrine attains its maximum about the period when the febrile symptoms are regularly established, and the decrease of corpuscles is almost always found to be accompanied with a corresponding increase of fibrine, but the proportion or quantity of saline matter is generally normal. Professional men are well aware that fibrine, when in excess in the blood,—the presence of which is marked by a rapid circulation incident to inflammatory diseased action,—is readily converted into the buffy-coat observed when the blood is quickly aostracted from the system ; and whenever this is present, there is always accompanying it an increased arterial pulsation. By the analysis given above, it will readily be appreciated that, as there is an increased supply of fibrine in the consumptive constitution (when the disease is irrevocably established) there is more necessity for depressants being em-

ployed. In relation to the chemical phenomena of respiration, it is known the exhalation of carbonic acid is greater according to age, and much muscular development. The older a person becomes, the more the carbonic acid decreases; and as the respiratory impulse is thus diminished, we know its advantage in the reduced pulsations or beats of the heart. The usual proportion between respiratory movements and the pulse being as 1 to $4\frac{1}{2}$ or 5. It may become in pneumonia as 1 to 3, or even in some cases as 1 to 2. Professor Matteucci, in *The Physical Phenomena of Living Bodies*, says, "besides atmospheric air, oxygen and protoxide of nitrogen are capable of maintaining respiration for some seconds. Perhaps in oxygen this function might go on for some time; but when this gas is breathed in a pure state, the respiratory movements are frequent, the arterial pulsations are accelerated, and the whole blood becomes of a very brilliant red."

Further, he says "that the respiratory

function is a purely physico-chemical phenomenon; that the gases dissolved in the venous blood are set free by the absorption of other gases; that a portion of the carbonic acid of the venous blood is exhaled by its absorption of the oxygen of the atmosphere; that the carbonic acid expired, at least the greatest part of it, is not formed on the lungs; that this gas exists dissolved in the venous blood, and is set free during the act of respiration, in presence of the oxygen which is introduced in its place, in the same manner as it is with azote or hydrogen in the artificial respiration of these gases; and lastly, that it is evident from the experiments of Magnus the quantity of carbonic acid gas, contained in the five pounds of blood which pass through the lungs in a minute, is nearly double that which is exhaled in the same space of time."

These extracts show the peculiar function of respiration; but although they demon-

strate by experiments the dangers of pure oxygen and protoxide of nitrogen to the vital system, yet the effects of the mixed gases,—the products of large towns,—on the human constitution, or rather on tubercular lungs, have not hitherto received any inquiry. I speak practically of their benefits in various disorders, having for their germ the tubercular diathesis. Louis is the first authority in tuberculosis, and he asserts that where predisposition exists to deposits of this nature, they may take place in every organ of the body, and exhibit themselves in the presence of hectic fever; for the practices of a bygone age, in pulmonary phthisis, are not likely to be supported in these days of sanitary improvement. And although these practices are opposed to all the present views of the treatment of such diseases; yet I can readily imagine that the observation and the practical experience, in medicine, of our forefathers, was as acute and correct as that of modern practitioners,

considering the limited resources at their command.

The plan pursued by medical men half a century before Buchan's time, was to recommend patients, affected with any delicacy of constitution and cough, early every morning to frequent cowsheds, sheepfolds, stables, farmyards, and even slaughter-houses; the object of the practice clearly was that they might inhale emanations disengaged from the animal and vegetable matter charged with carbonic acid; and such a course must have been attended, in many rightly selected cases, with great benefit:—irritability and excitement being lessened by the mixed nature of the air, there followed an abatement of active symptoms. The delicate texture of the lungs, injured by continued inflammatory action, will be as readily broken down by too pure an air as by habits of intemperance, and the tubercular diathesis being lighted up will soon bring about the destruction of the sufferer.

In a paper addressed to the Paris Academy of Science, Mr. Delbruck states, that he has made some researches on the quantity of air required for breathing during sleep. It strikes him as singular that—while all medical men are unanimous in prescribing several cubic metres of pure air for each person sleeping in a room, as absolutely indispensable for health—all animals appear to shun the open air as much as possible, in order to compose themselves to sleep. Thus, the lion and tiger retire to some dark cavern where the air is confined; the dog goes to his kennel, and thrusts his snout under his belly; birds, to which the open air would appear to be a necessity, whether asleep or awake, retire to some private corner and put their heads under their wings. Nay, what does a schoolboy do when left in a dormitory aired with particular care? If he finds he cannot fall asleep, the first thing he does is to bury his head under the bedclothes. Hence, the conclusion is that if

when awake, we exhale a quantity of carbonic acid, we must inhale a certain quantity of the gas during sleep, just as plants expel by day the oxygen they absorb during the night.

I must again, in repetition, say that the curative influence of "Change of Climate" in consumption has been over-estimated, and, in some instances, altogether misplaced. Sir James Clark has assailed with considerable force the doctrine that a change of climate is necessarily beneficial to persons suffering from consumption, and a French physician, M. Carrière, has written strongly against it. Dr. Burgess, an eminent Scotch physician, contends that climate has little or nothing to do with the cure of consumption, and that, if it had, the curative effects would be produced through the skin and not the lungs. That a warm climate is not in itself beneficial, he shows from the fact that the disease exists in all latitudes. In India and Africa, tropical climates, it is as

frequent as in Europe and North America. At Malta, right in the heart of the genial Mediterranean, the army reports of England show that one-third of the deaths among the soldiers are from consumption. At Nice, a favourite resort of English invalids, especially those afflicted with lung disease, there are more native persons die of consumption than in any English town of equal population. In Geneva the complaint is almost equally prevalent. In Florence pneumonia is said to be marked by a suffocating character, and a rapid progress towards its last stage. Naples, whose climate is the theme of so much praise by travellers, shows in her hospitals a mortality by consumption equal to one in two and one-third, whereas in Paris, whose climate is so often pronounced villainous, the proportion is only one in three and a-quarter. In Madeira no local disease is more common than consumption, and the trial of the climate of that island lately (1866) tested by the Brompton

Consumption Hospital, has so far failed in satisfactory results in the twenty patients who were sent there by the physicians, that it is not intended again by the authorities of the hospital to try the supposed beneficial influence of that much vaunted air.

Is change of air, then, of no value? Is the invalid never to move from house to house? Are the so-called bracing breezes of the "saline deep," or the oxygenised airs of the mountain tops, to be regarded as useless? To the weak and the sickly (we refer to those whose circumstances place them beyond the reach of poverty) a comfortable home is preferable to a "Change of Air." At this moment a common case presents itself to my mind; an invalid is just recovering from a severe attack of bronchitis. He sits in his snug room, in which there is a cheerful fire, the cricket is piping to him on the hearth, the light, bright almost to sunshine, the gas being manufactured from cannel-coal, is glittering on the snowy sheet,

which he is perhaps marring with his crudities, as some may term his notions; other comforts, which I need not enumerate, surround him. Say to such an one, "You go on well, but you would get on better still if you only had 'Change of Air.'" "*Credat Judæus!*" I reply to the healthful; "your advice may be all right; to me it sounds like a summons to shove off this mortal coil, and to tell me to put my house in order; under such circumstances it may be truly said that, with all its comforts and kind solacings and kinder endearments, 'There is no place like home.'"

All rational beings admit the wisdom and goodness of God in creation, for it is evident in all His works. It is known that different animal and vegetable products of the earth, with ever-varying quantities of elementary substances—viz., oxygen, nitrogen, hydrogen, and carbon—have different effects on the animal economy of the valetudinarian's temperament and constitution "for better or

for worse"; just so will different densities of air act and react on the functions of life, leading, if rightly selected, to improvement in health, and, if not, adapted to the aggravation of disease. Of this I have been tolerably convinced.

I am aware, at the same time, that in science, as in common life, we see many a theory, or novelty, apparently of value, which, when sobered by time, and matured by practice, presents less and less of the elements of permanence, and more and more those of oblivion; yet my belief is that the atmospheric theory as applied to medicine will be more lasting and more beneficial to mankind than most of those which have engaged the attention of the philosopher.

THE END.

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